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## GASTRO-ENTERITIS AND DYSENTERY IN CHILDREN: THE BACTERIOLOGY OF CASES CAUSED BY SALMONELLA AND DYSENTERY ORGANISMS.

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THE incidence of gastro-enteritis in children of this State varies, of course, from year to year, and of the total number of patients admitted to this hospital up to 5% are suffering from this disease. This figure was obtained in 1937 and in 1943, the lowest figure during the intervening years being 3% in 1940. The death rate has risen from 3% of gastro-enteritis cases in 1937 to 8% in 1943, an all-time record of 14% being reached in 1942.

The incidence of dysentery has considerably increased during the war years, for whereas in 1939 only one child was admitted to hospital suffering from clinical dysentery, 25 such patients were treated in the hospital in 1943. Only one death was reported in these five years.

Typhoid fever has not altered in incidence, the average being only one admission a year between 1937 and 1943.

These figures show a tendency similar to that reported by Weil,[1] who states that although the incidence of typhoid and paratyphoid fevers in the United States of America has declined during the years 1933 to 1940, the incidence of dysenteric infections has not lessened at all. He also states that in some States diarrhœa and enteritis rank highly as a cause of infant deaths, and that in North Carolina the mortality rate from these diseases was second only to that from prematurity, being higher in 1938 than in any of the preceding four years.

There is, then, no reason for complacency; but until the causes of these diseases are known no lessening of the seriousness of the problem can be expected. If the cause of a significant proportion of the cases can be determined, investigation may indicate a means of preventing the continuance of the infection.

By the use of selective culture media such as tetrathionate broth and Leifson's desoxycholate-citrate medium, the causative organism can be obtained from the fæces of more patients with gastro-enteritis and dysentery than hitherto, and the prevalence of sickness caused by Salmonella and dysentery organisms can be more accurately gauged. In this hospital Salmonella organisms have been isolated from the fæces of approximately 10% of the gastro-enteritis patients and the causative organism from up to 90% of the patients listed as suffering from clinical dysentery.

The successful isolation of pathogenic organisms from the fæces is dependent upon such factors as the time which has elapsed between infection and the collection of the specimen, the use of satisfactory culture media and the early cultivation of the specimen when obtained. Even under the most favourable conditions the causative organism is not likely to be isolated in every case.

If in all cases of dysentery and Salmonella gastro-enteritis typical agglutinins were produced in the serum, the agglutination test would be a better diagnostic aid than fæcal examination, and by the use of the test a more accurate estimate of the incidence of these types of infection could be obtained. As has been reported elsewhere,[2] natural flagellar agglutinins of the Salmonella organisms were found to be absent from serum of children not suffering from enteritis, and of the somatic agglutinins, only those of *Bacterium typhosum* were detected. They were present in very low titre, which did not exceed 1 in 32. Within the limits imposed by the possible presence of this agglutinin, the detection of specific immune agglutinins in a specimen of serum, irrespective of the titre, will indicate an infection by organisms possessing the corresponding antigens.

The Salmonella organisms possess different types of antigens—namely, the somatic and flagellar antigens. The somatic antigens are situated on the body of the organism and are called the "O" antigens, whilst the flagellar antigens are, as their name suggests, part of the flagella of the organism, and are usually referred to as "H" antigens. Some Salmonella organisms are diphasic—that is, the predominant antigen present on the flagellum is one of two types. These types of flagellar antigens are usually the specific-phase type, which are shared by the particular organism and only a few other species, and the group-phase type of antigens which are shared by many diphasic Salmonella species. When the antigenic formula of a diphasic Salmonella organism is quoted, the somatic antigens are given first in Roman numerals (as I, II, III *et cetera*), the specific flagellar antigens are placed next in small arabic letters (as *a*, *b*, *c et cetera*), and then the group flagellar antigens are given in large Arabic numerals (as 1, 2, 3 *et cetera*). For instance, *Bacterium typhi-murium* has an antigenic formula I, IV, V, XII : *i* : 1, 2, 3. The Salmonella organisms are divided into groups which possess the same predominant somatic antigens, and these groups are subdivided according to their specific and group flagellar antigens. Thus different Salmonella species may have the same somatic antigens but different specific flagellar antigens, whereas other different species have the same specific flagellar antigens but different somatic antigens. Examples of the first type are *Bacterium para-typhosum B* (I, IV, V, XII : *b* : 1, 2) and *Bacterium typhi-murium* (I, IV, V, XII : *i* : 1, 2, 3), and of the second type *Bacterium stanley* (I, IV, V, XII : *d* : 1, 2, 3) and *Bacterium* typhosum (I, IX, XII : *d* : –). In the above examples the first three species are diphasic, and when freshly isolated, are usually in either the group phase—that is, the group antigens are the predominant flagellar antigens—or the specific phase, in which case the specific antigens are the predominant antigens. Organisms which can exist in either phase usually remain in the one phase for eighteen to twenty-four hours before changing to the alternative phase, and this property is used when suspensions of diphasic organisms in one particular phase are being prepared.

It can be seen that in the case of a person who has been infected by a Salmonella strain which possesses the somatic, specific flagellar and group flagellar antigens, the serum may contain the three corresponding agglutinins. If these can be demonstrated, then, provided that the titre of the agglutinin of *Bacterium typhosum* "O", when present as a result of infection, is above 1 in 32, the infecting organism can be determined with reasonable certainty. However, if only one type of Salmonella agglutinin is detected, and this is not the natural *Bacterium typhosum* agglutinin, the conclusion to be drawn is that a Salmonella infection is, or has been, present, but that the responsible organism cannot be named.

The presence of natural agglutinins would, of course, make difficult the interpretation of the result of the test. This difficulty arises in the agglutination test in Flexner dysentery cases. According to their ages, the serum of non-enteritis children can contain, as well as the *Bacterium typhosum* "O" agglutinin, the agglutinins of all types of Flexner organisms except Flexner type II.[2] In addition to these natural agglutinins there is also the possibility that group agglutinins may be present in the serum of persons infected by Flexner organisms. The six Flexner types of Boyd[3] contain one antigen which is common to all, and other antigens which are shared by two or more strains. These are called the group antigens. Each of the six types also possesses an antigen which is specific for the particular type. The agglutinins which arise as a result of the stimulation of the antibody-producing apparatus by the group antigens of the Flexner organisms are called the group agglutinins, and these group agglutinins are responsible for the non-specific agglutination which takes place between the different types of Flexner organisms and their antisera. It is therefore possible that infection by one Flexner type may cause the production of group agglutinins in the patient's serum, and that these group agglutinins, if in sufficient concentration, may agglutinate Flexner organisms of types other than the one which caused the infection. This non-specific agglutination added to the agglutination of Flexner organisms by natural agglutinins may make the test valueless in cases of dysentery. If, however, the Flexner type II agglutinin appears in the serum of patients whose illness has been caused not only by this organism, but also by the other Flexner strains, then a simple test is available for the diagnosis of a Flexner infection, although the responsible type of Flexner organism cannot be determined.

The purposes of this paper are to record my experiences in the use of the various culture media for the isolation of Salmonella and dysentery organisms from the fæces, to study the general bacteriology of the cases recorded in this hospital during the years 1942-1943 and 1943-1944, and to determine the value of the agglutination test as a diagnostic aid in cases of enteritis in children.

## EXPERIMENTAL INVESTIGATION.

Serum of gastro-enteritis and dysentery patients, from whose fæces the causative organism was isolated, were collected at different periods in the children's illnesses.

The organisms used in the agglutination tests were the same as those used in the work on the natural agglutinins,[2] and consisted of nine flagellar and fifteen somatic suspensions.

The flagellar suspensions were those of the following organisms in the specific phase: *Bacterium paratyphosum* A, B, C, *Bacterium typhosum*, *Bacterium typhi-murium*, *Bacterium reading*, *Bacterium bovis-morbificans* and *Bacterium enteritidis, and Bacterium typhi-murium* in the group phase.

The somatic suspensions were those of paratyphoid and typhoid organisms, the seven Flexner types (I to VI, Y), the Sonne, Shiga and Schmitz organisms and *Bacterium adelaide*.

The agglutination tests were performed in conjunction with similar tests on the serum of non-enteritis patients. The serum was diluted twenty times with saline solution, and an equal quantity (0·2 millilitre) of each suspension was added. The tubes were placed in the water-bath at 52° C. for two hours, when the results of the tests with the flagellar suspensions were read. The tubes containing the somatic suspensions were left overnight at room temperature and then the results were read. When the result was positive, the titre was then determind. If the suspensions of the organisms causing the child's enteritis were not agglutinated, the tests with these organisms were repeated with the serum diluted serially four to 32 times. In addition, as many of the other suspensions were used at these dilutions as the quantity of serum would allow. The last-mentioned tests were carried out to act as controls and to detect non-specific agglutinins arising as a result of the infection.

The readings were made with the aid of a hand-lens in all cases.

### The Isolation of the Organisms from the Fæces (1943-1944 Series).

The value of tetrathionate broth for the isolation of the Salmonella organisms is well known. It is unfortunate that this medium will not support the growth of the dysentery organisms. For the isolation of these organisms the usefulness of desoxycholate medium of Leifson has been demonstrated by Hynes.[4]

For the 1942-1943 series of cases MacConkey's agar and tetrathionate broth were used and the results are reported elsewhere;[5] but when the first of the 1943-1944 cases of Flexner dysentery appeared, Leifson's medium was prepared and its value was compared with that of MacConkey's agar ("Difco"). The formulæ of Leifson's medium and tetrathionate broth were essentially those of Hynes. The occurrence of cases of Salmonella gastro-enteritis about the same time made possible the comparison of the two solid media and the tetrathionate broth for the isolation of the Salmonella organisms. Owing to short supplies of the various chemicals, the same types of media could not be used throughout, and when different combinations of media were used, the results are given under different headings.

Thus Table I shows the number of specimens from which the dysentery or Salmonella organisms were isolated when different combinations of media were used as the year proceeded. When the available supply of MacConkey's agar was used, this medium was replaced by "SS" agar ("Difco"), which is similar to Leifson's medium except that the desoxycholate of the latter is replaced by bile salts. Series II, then, comprised "SS" agar, Leifson's agar and tetrathionate broth. In this series were two specimens containing the Sonne bacillus. This organism was isolated on "SS" medium, but not on Leifson's medium nor in tetrathionate broth. The third series—"SS" agar and tetrathionate broth—was used when desoxycholate was no longer available. At this stage the specimens were from children who had recovered from the infection, but who were detained in hospital to clear up the carrier state.

TABLE I.

| Series. | Number of Specimens of Fæces Containing | | Medium. | Number of Specimens from which the Organism was Isolated. | |
|---|---|---|---|---|---|
| | Dysentery Organisms. | Salmonella Organisms. | | Dysentery. | Salmonella. |
| I | 22 | 31 | MacConkey .. | 10 | 2 |
| | | | Leifson .. | 21 | 14 |
| | | | Tetrathionate broth .. | 0 | 29 |
| II | 19 | 35 | "SS" agar .. | 16 | 17 |
| | | | Leifson .. | 13 | 15 |
| | | | Tetrathionate broth .. | 0 | 29 |
| III | 3 | 35 | "SS" agar .. | 3 | 7 |
| | | | Tetrathionate broth .. | 0 | 35 |

The results show that, for the isolation of the Salmonella organisms, tetrathionate broth is the best of the media used, and of the solid media, desoxycholate and "SS" agar are approximately equal in value. MacConkey agar did not compare at all favourably with the others. For the isolation of dysentery organisms "SS" and desoxycholate agar were of equal value and far superior to MacConkey agar. Tetrathionate broth inhibited the growth of the dysentery bacilli, and desoxycholate did not favour the growth of the Sonne bacillus.

It appears that better results can be expected when two or more media are used, and it is suggested here that for the isolation of Salmonella organisms the media of choice are tetrathionate broth and "SS" agar, and that for the isolation of dysentery bacilli "SS" agar and desoxycholate agar give best results.

### The Identification of the Organisms (1943-1944 Series).

Suspected colonies chosen from the media, either after direct plating of the fæces or after plating of the tetrathionate broth on to "SS" agar or desoxycholate agar, were stabbed and stroked on to Kligler's iron agar ("Difco"). Cultures showing the correct reactions in this medium were tested by slide agglutination with appropriate antisera.

Cultures of the Salmonella organisms were sent to the Salmonella typing centre at the Institute of Medical and Veterinary Science, Adelaide, where they were identified. These strains have been reported on in detail by Atkinson, Woodroofe and Macbeth.[6]

The Flexner organisms were typed by agglutination with monospecific antisera prepared by absorbing the type antiserum with a suspension of Flexner type Y organism. The identification of these organisms was confirmed by the precipitin test previously described.[7]

### The Cases of Salmonella Infection.

#### *Types of Organisms Isolated.*

In the 1942-1943 series *Bacterium typhi-murium* was isolated in 20 cases and *Bacterium reading* in two cases. The antigenic structure of the strains of *Bacterium reading* conformed with that of the standard type cultures.

The distribution of the somatic antigen of the *Bacterium typhi-murium* strains was as follows: I, IV combination, 11 strains; I, IV, V combination, 4 strains; IV, V combination, 2 strains; and IV antigen, 3 strains. All strains possessed the XII somatic antigen.

In the 1943-1944 series *Bacterium typhi-murium* was isolated in 22 cases, *Bacterium kensington* in two cases, *Bacterium bovis-morbificans* in three cases, and *Bacterium newport* and *Bacterium adelaide* in one case each. The *Bacterium kensington* strains differed from the standard *Bacterium reading* strain in the formula of the group phase. A report on this strain has been published.[8]

The distribution of the somatic antigens of the *Bacterium typhi-murium* strains was as follows: All possessed the XII somatic antigen, and in addition to this antigen one had the I, IV, four the I, IV, V, 15 the IV, V, and two the IV formulæ.

I am indebted to Miss N. Atkinson and Miss G. Woodroofe for details of the antigenic structure of the organisms.

#### *Distribution of the Cases.*

The distribution of the cases in the 1943-1944 series was not so widespread as in the previous epidemic, when, with the exception of five cases in the city, they came from many parts of the metropolitan area.

Five of the 1943-1944 cases came from the city area and nine from districts containing "pugholes" used as rubbish dumps or from districts containing factories with open refuse dumps. Three children became infected in hospital and the others came from various parts of the metropolitan area.

"Pugholes" and refuse dumps are ideal places for breeding rodents, and if these rodents were infected by Salmonella organisms, the occurrence in the neighbourhood of the dumps of cases of gastro-enteritis caused by these organisms would not be surprising.

#### *Seasonal Incidence.*

Unlike the previous epidemic, all the patients in the 1943-1944 series were admitted to hospital during the summer of 1943-1944. Three patients were admitted in October, five in November, one in December, 1943, five in January, 1944, eight in February, six in March, and one in April. These are the hot-weather months, when flies and other insects are prevalent.

#### *Age of Patients.*

The majority of those requiring hospital attention were infants aged under two years. Table II shows the number in the various age groups for both the 1942-1943 and 1943-1944 epidemics.

The figures show that the average age of the 1943-1944 group was higher than that of the 1942-1943 series. One possible explanation is that the older children eat more

TABLE II.

| Series of Cases. | Age Group. | | | | | | | | | | | | Approximate Average. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Under 1 Year. | 1 Years. | Years. | Years. | 4 Years. | 5 Years. | 6 Years. | 7 Years. | 8 Years. | 9 Years. | 10 Years. | 11 Years. | |
| 1942–1943 .. .. | 15 | 3 | 3 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0·9 year. |
| 1943–1944 .. .. | 10 | 9 | 4 | 0 | 1 | 2 | 2 | 0 | 0 | 0 | 0 | 1 | 2·3 years. |

ice-cream and other milk foods in the summer than in the winter, and therefore are more likely to become infected during the summer months. None of the babies of either series were breast-fed.

*Length of Stay in Hospital.*

If the severity of an infection can be gauged by the length of time for which the child requires hospital attention, then the 1943-1944 epidemic was not so severe as the previous one. The children were not discharged from hospital until three consecutive specimens of fæces—not necessarily collected on following days—were free of the infecting organism. Table III shows the length of stay in hospital of the patients during the 1942-1943 and the 1943-1944 epidemics. The children not included in the table are two of the 1942-1943 series who died, two children of the 1943-1944 series who became infected in hospital and required further attention after they were free of the infecting organism, and another of the same series who was removed from hospital without treatment.

The babies required longer hospital attention than the older children. In the first series nine children were in hospital for longer than the average period, and all were under the age of nine months; in the second series eleven children were in hospital for longer than the average period for this series, and of these seven were aged under twelve months and three others were aged under two years.

*Pathogenic Effects of the Organisms.*

In contradistinction to the 1942-1943 series, in which numerous bowel actions were the rule, in many cases for five or six weeks, the 1943-1944 patients suffered little diarrhœa. Vomiting and elevation of temperature were rarely present, and complications were present in only a few cases. Twenty-one patients had a normal number of bowel actions within two days of admission to hospital. Eleven of the children had only one "positive" specimen of fæces before their discharge from hospital. The infecting organism was constantly isolated in one case for seven weeks after infection; but this was exceptional, because most of the children ceased excreting the causal organism within three weeks of infection.

Of the 26 children who were admitted to hospital with gastro-enteritis caused by one of the Salmonella organisms, only five suffered complications. Four developed *otitis media* and one contracted pneumonia, but there were no deaths. This was in contrast with the 1942-1943 series, in which 13 of the 22 patients contracted other infections, 11 of which were *otitis media*. In this series there were three deaths.

*The Value of the Sulphonamide Drugs.*

All except six patients of the 1943-1944 series were given one of the sulphonamide drugs. Fourteen were treated with sulphaguanidine, six with sulphapyridine and three with sulphadiazine. Five children were given 80 grammes or more of sulphaguanidine without any apparent toxic effects. There was no evidence that the drugs had any value as intestinal disinfectants of the Salmonella organisms, or that the use of the drugs lessened the children's stay in hospital. One child, aged five months, who received 196 grammes of sulphaguanidine, was in hospital for 53 days. She excreted the organisms for 23 days during the time that the drug was administered. Another child, aged two years, received 145 grammes of sulphaguanidine over a period of 35 days. The infecting organism was present in the fæces during the first 17 days.

The absence, whilst in hospital, of diarrhœa and vomiting could not be attributed to the administration of sulphonamide drugs, because of the six children who were not treated with the drugs, four had no diarrhœa or vomiting after their admission to hospital, one had diarrhœa for one day, and there was no record of the sixth, who was not treated in hospital.

## The Agglutination Test with Serum from Patients with Gastro-Enteritis.

*Incidence of Salmonella Agglutinins.*

The serum from 25 patients suffering from gastro-enteritis, from all of whom the infecting organism had been isolated, was available for study. The serum was collected between three and sixty-five days after infection, which is regarded in this work as being the day before diarrhœa commenced. From 14 of these patients two or more specimens of serum taken at different times were examined. The results showing the number of patients whose serum contained one or more agglutinins and the strains of organisms whose agglutinins were present are given in Table IV. The lowest dilution of the serum before addition of the suspension of organisms was one in four.

Of the nine patients whose serum contained the somatic agglutinins, that of six also contained both types of flagellar agglutinins and three contained only the group-phase flagellar agglutinins. Five of the patients whose serum contained all three types of agglutinins were suffering from *Bacterium typhi-murium* infection and the other was suffering from *Bacterium bovis-morbificans* infection.

To determine the length of time that elapses before the agglutinins appear, blood was collected from the 25

TABLE III.

63 days

| Series. | Days in Hospital. | | | | | | | | | | | | | Average. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0 to 10 | 11 to 20 | 21 to 30 | 31 to 40 | 41 to 50 | 51 to 60 | 61 to 70 | 71 to 80 | 81 to 90 | 91 to 100 | 101 to 110 | 111 to 120 | 121 to 130 | 131 to 140 | |
| 1942–1943 .. .. .. .. | 0 | 2 | 1 | 3 | 1 | 3 | 2 | 3 | 0 | 0 | 1 | 2 | 0 | 1 | 63 days |
| 1943–1944 .. .. .. .. | 1 | 4 | 9 | 8 | 1 | 1 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 31 days |

TABLE IV.

*Types of Agglutinins Present in Salmonella Cases.*

| Infecting Organism. | Number of Patients Examined. | Number of Patients with One or More Salmonella Agglutinins. | Type of Agglutinins. | | | |
|---|---|---|---|---|---|---|
| | | | Specific "H". | Group "H". | Both "H". | Somatic. |
| *Bacterium typhi-murium* .. | 19 | 14 | 10 | 11 | 7 | 8 |
| *Bacterium bovis-morbificans* .. | 3 | 2 | 2 | 1 | 1 | 1 |
| *Bacterium adelaide* .. .. | 1 | 1 | 1 | Monophasic | | 0 |
| *Bacterium newport* .. .. | 1 | 1 | 1 | 0 | 0 | 0 |
| *Bacterium kensington* .. .. | 1 | 0 | 0 | 0 | 0 | 0 |
| All organisms .. .. .. | 25 | 18 | 14 | 12 | 8 | 9 |

patients at different times after infection. Fifty-five specimens of blood were obtained and the results are shown in Table X, in which the time of collection is divided into periods of ten days. The serum is from the patients listed in Table V.

The results indicate that the agglutinins are present in the serum of the majority of patients in the second, third and fourth weeks after infection. Sufficient serum was not available to allow of the formation of an opinion about the presence of agglutinins after this time.

*Concentration of the Agglutinins at Different Periods after Infection.*

To demonstrate the period after infection when the highest titres of the different agglutinins were observed, Table VI has been divided into three sections. The titres varied from 1 in 8 to 1 in 10·240. The serum of nine patients had titres of 1 in 320 or more; the agglutinin present in highest concentration was the group-phase agglutinin in six cases, the specific-phase agglutinin in two cases and the somatic agglutinin in one case. Of the eight cases in which the serum contained both types of flagellar agglutinin, the group-phase agglutinin predominated in six cases and the specific-phase agglutinin in two cases. The specimens of serum used are those listed in Table V.

The results given in Table VI in conjunction with those in Table V show a tendency for the highest titres to be obtained in the second and third weeks after infection, after which time the titre tends to fall. This is particularly noticeable in the cases in which the somatic agglutinins are present in the serum. This tendency to fade is illustrated more clearly in the results of the examination of four patients. Three specimens of blood were collected from each at different periods, the agglutinins present being the specific-phase flagellar agglutinins of *Bacterium typhi-murium* in one case and the group-phase flagellar agglutinins of the same organism in the other three cases.

*The Value of the Agglutination Test for the Diagnosis of a Salmonella Infection.*

Natural flagellar agglutinins of the Salmonella organisms are absent from the serum of children not infected by Salmonella organisms, so that the appearance of flagellar agglutinins of these organisms is indicative of a Salmonella infection. As the only natural agglutinins of the Salmonella organisms which were detected were those of *Bacterium typhosum* "O", the presence of the somatic agglutinins in the serum will aid the identification of the infecting organism. The extent of the identification will be limited by the nature of the antigenic structure of the Salmonella organisms.

TABLE VII.

*Titres of Flagellar Agglutinins at Different Periods after Infection.*

| Patient. | Type of Agglutinin. | Days after Infection. | | | |
|---|---|---|---|---|---|
| | | 0 to 10 | 11 to 20 | 21 to 30 | 31 to 40 |
| E | Group "H". | 0 | 640 | 160 | |
| S | Group "H". | 320 | 320 | 80 | |
| O | Group "H". | | 10.240 | 2.560 | 640 |
| B | Specific "H". | | 320 | 320 | 80 |

The serum of twenty patients suffering from gastro-enteritis, from whose fæces Salmonella organisms were not isolated, was examined. Agglutinins of Salmonella organisms were detected in the serum of six patients, and in four of these sufficient types of agglutinins were present to permit the identification of the infecting organism with reasonable certainty. The results are given in Table VIII.

The identification of the organism causing the appearance of the agglutinins in the serum of "G" was strengthened by absorption of the flagellar agglutinins by the two organisms *Bacterium adelaide* and *Bacterium enteritidis*. The flagellar agglutinins were completely absorbed by the former organisms but not by the latter; this showed that one of the agglutinins was due to the *g* specific-phase antigen. The presence of somatic agglutinins of *Bacterium paratyphosum* B but not of *Bacterium typhosum* suggests that the infecting organism came from the former group—that is, the B group in the Kauffman-White classification. The most common organism with the *g* specific-phase flagellar antigen in the B group is *Bacterium derby*. This organism has been isolated from patients in South Australia.

### The Dysentery Cases.

*Types of Organisms Isolated.*

In the 1942-1943 series of cases 26 children were infected by one of the Flexner strains and two by the Sonne organism. In addition, 12 hospital patients became infected with the Sonne organism. As has already been reported,[6] 23 of the Flexner strains were of type II, two were of type V, and one was a type IV strain.

In the 1943-1944 series, 30 cases of dysentery were caused by Flexner organisms and two by Sonne strains. Of the Flexner strains, 26 were of type II, three were of type VI and one was a type IV strain. The reactions of the type VI strains were similar to Boyd's Indian strain—type LXXXVIII.

TABLE V.

*Salmonella Agglutinins Present at Different Periods after Infection.*

| Patients Examined. | Days after Infection. | | | | | | |
|---|---|---|---|---|---|---|---|
| | 0 to 10 | 11 to 20 | 21 to 30 | 31 to 40 | 41 to 50 | 51 to 60 | 61 to 70 |
| Total .. .. .. | 19 | 15 | 7 | 4 | 2 | 1 | 2 |
| Number whose serum contained agglutinins .. | 11 | 12 | 6 | 3 | 1 | 1 | 1 |

TABLE VI.

*Concentration of the Different Agglutinins in the Serum.*

| Type of Agglutinin. | Titre. | Days after Infection. | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | 0 to 10 | 11 to 20 | 21 to 30 | 31 to 40 | 41 to 50 | 51 to 60 | 61 to 70 |
| Group "H" .. | 1 in 40 or under .. .. .. .. .. .. | 2 | 1 | 2 | — | 1 | — | — |
| | 1 in 80 to 1 in 320 .. .. .. .. .. .. | 1 | 3 | 2 | 1 | — | 1 | 1 |
| | Over 1 in 320 .. .. .. .. .. .. | 4 | 5 | 1 | 1 | — | — | — |
| Specific "H" | 1 in 40 or under .. .. .. .. .. .. | 4 | 5 | 2 | — | — | — | — |
| | 1 in 80 to 1 in 320 .. .. .. .. .. .. | 3 | 2 | 2 | 2 | — | 1 | 1 |
| | Over 1 in 320 .. .. .. .. .. .. | — | 1 | — | — | — | — | — |
| Somatic .. | 1 in 40 or under .. .. .. .. .. .. | 2 | 1 | 2 | 1 | — | — | — |
| | 1 in 80 to 1 in 320.. .. .. .. .. .. | 3 | 6 | 1 | — | — | — | — |

TABLE VIII.

*Salmonella Agglutinins Present in Cases of Unidentified Gastro-enteritis.*

| Patient. | Agglutinins. | | | | | Probable Infecting Organism. |
|---|---|---|---|---|---|---|
| | Specific-phase "H". | | Group "H". | Somatic. | | |
| | Type. | Titre. | Titre. | Type. | Titre. | |
| W. | *Bacterium typhi-murium* (i). | 320 | 320 | *Bacterium paratyphosum* B. | 40 | *Bacterium typhi-murium.* |
| D. | *Bacterium typhosum* (d). | 640 | 16 | *Bacterium paratyphosum* B. | 40 | *Bacterium stanley.* |
| G. | *Bacterium adelaide* (*f. g*).<br>*Bacterium enteritidis* (*g. o. m*). | 320<br>160 | 0 | *Bacterium paratyphosum* B. | 16 | *Bacterium derby.* |
| M. | *Bacterium typhi-murium* (i). | 8 | 40 | Nil. | | *Bacterium typhi-murium.* |
| R. | Nil. | | 80 | *Bacterium paratyphosum* B. | 40 | ? |
| H. | Nil. | | 160 | *Bacterium paratyphosum* B. | 8 | ? |

*Distribution of the Cases.*

The cases of both series had a similar distribution. The majority of the children came from the "pughole" or adjacent industrial areas, and there was a considerable similarity between the distribution of the dysentery cases and that of the 1943-1944 series of Salmonella cases.

*Seasonal Incidence.*

The majority of cases occurred in the hot summer months. In the 1942-1943 series seven patients were admitted to hospital in December, 1942, and four in March, 1943. In the 1943-1944 series four patients were admitted to hospital in September, 1943, ten in January, 1944, and five in February, 1944. The seasonal incidence of this series was similar to that of the 1943-1944 series of Salmonella cases.

*The Age of the Patients—Flexner Infections Only.*

As can be seen from Table IX, the majority of the children were below six years of age, but the average age was higher than that of the Salmonella patients.

The majority of the patients were of the pre-school age, and this suggests that they became infected in the home.

*The Length of Stay in Hospital and the Effect of Sulphonamide Drugs.*

Only ten children of the 1942-1943 Flexner series received sulphonamide drugs, two being treated with sulphaguanidine and eight with sulphapyridine. The remaining 16 received no sulphonamide drugs. Twenty-five of the 1943-1944 Flexner series were treated with sulphonamide drugs, and of these, 19 were given sulphaguanidine and six were given sulphapyridine. It is interesting to compare the length of stay in hospital of the patients in each series and to determine if possible the effect that treatment with the sulphonamide drugs had on lessening this period.

As can be seen from Table X, the use of the sulphonamide drugs did not aid a quick discharge from hospital, although 12 children of the second group received over 50 grammes of sulphaguanidine.

The increased length of stay in hospital of the second series of patients was probably due to the use of improved culture media for isolating the organisms. The requirements for discharge from hospital were the same as for the Salmonella series—namely, that three consecutive specimens of fæces, not necessarily collected on following days, should be free of the infecting organism. It is obvious that the more efficient culture media will isolate the infecting organisms from some specimens of fæces of otherwise healthy children and require their detention in hospital for longer periods than previously.

*Pathogenic Effects of the Organisms.*

One child from each Flexner series died as a result of the infection.

In the 1942-1943 series, 17 children had frequent bowel actions for three or more days after their admission to hospital, and five had elevated temperatures for this period. Vomiting was rarely present. There were no readmissions to hospital.

In the 1943-1944 series only five of the children had frequent bowel actions for three or more days after their admission to hospital. Seventeen had no diarrhœa after the first day, and only two had elevated temperatures. As before, vomiting was rare. Three children were readmitted to hospital with diarrhœa, and from one of these the same causal organism was recovered.

In the second series ten children who suffered no diarrhœa after their admission to hospital were given sulphaguanidine within one day of admission. Six other children, who also had no diarrhœa, did not receive sulphonamide treatment until four or more days after admission to hospital. Another child, who had frequent

TABLE IX.

| Series. | Age. | | | | | | | | | | | | Approximate Average. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Under 1 Year. | 1 Year. | 2 Years. | 3 Years. | 4 Years. | 5 Years. | 6 Years. | 7 Years. | 8 Years. | 9 Years. | 10 Years. | 11 Years. | |
| 1942-1943 .. .. .. | 2 | 3 | 3 | 6 | 5 | 3 | 1 | 1 | 1 | 0 | 0 | 0 | 4 years. |
| 1943-1944 .. .. .. | 6 | 1 | 4 | 7 | 2 | 4 | 1 | 1 | 0 | 1 | 0 | 0 | 3·5 years. |

TABLE X.

| Series. | Days in Hospital. | | | | | | Average. |
|---|---|---|---|---|---|---|---|
| | 0 to 10 | 11 to 20 | 21 to 30 | 31 to 40 | 41 to 50 | 51 to 60 | |
| 1942-1943 .. .. | 3 | 10 | 9 | 3 | 0 | 0 | 17 days |
| 1943-1944 .. .. | 0 | 11 | 7 | 4 | 1 | 2 | 23 days |

bowel actions for 28 days, commenced sulphaguanidine treatment on the day after admission to hospital, and the treatment was continued for nine days; the child received in all 25 grammes.

It seems probable that the longer period of diarrhœa suffered by the 1942-1943 patients was due to a more toxigenic strain of organism, and that treatment with sulphaguanidine had no bearing on the shorter period of diarrhœa in the 1943-1944 series.

### *The Agglutination Test with Serum of Patients Suffering from Dysentery.*

The possibility that the serum from patients suffering from dysentery caused by Flexner organisms may contain both natural and group agglutinins of the Flexner organisms, complicates the problem of assessing the value of the agglutination test in these cases. Although the presence of group agglutinins is obvious in antiserum prepared by the injection of Flexner organisms into rabbits, there is little information available on the production of the group agglutinins by children infected by one of the Flexner strains. If group agglutinins are produced by infection with different Flexner strains, the presence of the agglutinins of Flexner type II in the serum of a child suffering from clinical dysentery would indicate an infection by one of the Flexner strains, because natural agglutinins of the type II organism were not found in the serum of the non-enteritis children.[2] Unfortunately the Flexner type II organism was responsible for the majority of cases of dysentery in children in this State, and most of the experiments were made on serum from these patients, so that it was not possible to obtain much information on the production of group agglutinins.

### *The Incidence of Agglutinins of Flexner Type II in the Serum of Children Infected by this Strain.*

Forty-seven specimens of serum from 24 patients suffering from dysentery were available for study. Flexner type II organisms were isolated from the fæces of all these patients, and the blood was obtained at different times after infection, which, as in the Salmonella cases, is regarded as the day before diarrhœa commenced. The results are given in Table XI, which shows the incidence of the agglutinins of Flexner type II in cases caused by this strain, and also the incidence of the agglutinins at various periods of the disease.

The figures show that agglutinins of the Flexner type II organisms were present in the serum of the majority of the patients. The agglutinins did not appear in less than five days after infection and were present most consistently in the second and third weeks after infection.

### *The Concentration of the Flexner Type II Agglutinins in the Serum.*

In the cases of Flexner type II dysentery discussed here, the concentration of the agglutinins of this organism did not reach the high levels obtained with the agglutinins of the Salmonella organisms in gastro-enteritis cases. As will be seen in Table XII, the highest titre of any of the specimens of serum was 1 in 320 for the Flexner type II agglutinins, and the majority of specimens had titres of under 1 in 40.

In the cases examined the highest titres were obtained in the second week after infection. After this time there was a fall in titre, and in some cases the agglutinins were absent. The two patients whose serum contained the agglutinin in the 36 to 40 day period were excreting the infecting organism at the time the serum was collected. These children may be regarded as "carriers" of the organism.

### *The Incidence of Agglutinins in Cases of Dysentery Caused by Other Flexner Types.*

The serum of three patients with Flexner type VI infections, of two with Flexner type V infections, and of one with a Flexner type IV infection was examined. One of the type VI patients was examined two days and ten days after infection. The first specimen of serum had a titre of 1 in 80 for the infecting organism and contained no agglutinins of Flexner type II. The second specimen, however, agglutinated the causative organism in a dilution of 1 in 320 and also agglutinated the Flexner type II organism to a titre of 1 in 16. The accessory agglutinin was evidently produced as the result of the infection. The titre of the Flexner type Y agglutination rose from 1 in 80 to 1 in 640. The serum of the other two type VI patients did not agglutinate the causative organism above the normal limit (1 in 160).[2] However, the serum of one of these agglutinated the type II organism in a dilution of 1 in 8. The titres for the other Flexner types were not above normal.

Since the completion of the above series the serum of eight more type VI patients has been examined. In these specimens the titre of the type VI agglutinin was 1 in 640 in one case, 1 in 320 in five cases, and normal in the others. In all these cases the type II agglutinins were detected, the titre varying from 1 in 160 to 1 in 16. This titre was not necessarily parallel with the type VI titre. In six of these cases the titre of the type Y agglutinin was above 1 in 160. These cases are mentioned to confirm the presence of type II agglutinins in the serum of patients with type VI infections.

The serum of Flexner type V patients agglutinated the causative organism in dilutions of 1 in 40 and 1 in 16 respectively. Both children were five years of age, and therefore were below the age when natural agglutinins of this organism are detected.[2] More significant, perhaps, was the appearance of Flexner type II agglutinins in titres of 1 in 32 and 1 in 8 respectively.

The serum of the patient with the Flexner type IV infection did not agglutinate the causative organism above normal limits, nor were type II agglutinins detected in it.

TABLE XI.
*Incidence of Agglutinins of Flexner Type II Organisms.*

| Serum. | Days After Infection. | | | | | | | | Total Cases. |
|---|---|---|---|---|---|---|---|---|---|
| | 0 to 5 | 6 to 10 | 11 to 15 | 16 to 20 | 21 to 25 | 26 to 30 | 31 to 35 | 36 to 40 | |
| Number of specimens examined | 8 | 9 | 10 | 9 | 5 | 1 | 3 | 2 | 24 |
| Number containing agglutinins | 0 | 9 | 10 | 7 | 3 | 1 | 0 | 2 | 22 |

TABLE XII.
*The Concentration of the Flexner Type II Agglutinins.*

| Serum. | Days After Infection. | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 0 to 5 | 6 to 10 | 11 to 15 | 16 to 20 | 21 to 25 | 26 to 30 | 31 to 35 | 36 to 40 |
| Number of specimens of serum examined .. .. .. | 8 | 9 | 10 | 9 | 5 | 1 | 3 | 2 |
| Number with titre of one in 40 or under .. .. | — | 7 | 6 | 6 | 3 | 1 | — | 2 |
| Number with titre of one in 80 to one in 320 .. .. | — | 2 | 4 | 1 | — | — | — | — |
| Number with titre over one in 320 .. .. .. .. | — | — | — | — | — | — | — | — |

The results of the examination of the patients with Flexner types V and VI infections show that although the titres of the agglutinins of the causative organisms may not rise above the normal levels, the presence of Flexner type II agglutinins can be detected in most of them. The presence of this agglutinin is therefore diagnostic of a Flexner infection, although the type of Flexner organism causing the infection cannot be specified.

*The Incidence of Agglutinins in the Sonne Cases.*

The serum of four patients with Sonne infections was examined; but none of these specimens agglutinated the Sonne strain used, nor did any of them contain Flexner agglutinins in concentrations above normal limits.

However, the variable nature of the antigenic structure of the Sonne organism is illustrated by the following experience.

Subsequent to the above examinations, a child was admitted to this hospital suffering from clinical dysentery. An organism isolated from the fæces fermented only glucose and mannite, no gas being produced. Suspensions of this organism were not agglutinated by any of the types of dysentery (including Sonne) antiserum obtained from the Commonwealth Serum Laboratories. Agglutination tests with the child's serum gave positive results, the titre being 1 in 128. The fermentation reactions were allowed to proceed for eight days, and at the end of this time lactose had been fermented. A suspension of the organism, of which several subcultures had been made in the meantime, was now agglutinated by the Sonne (Commonwealth Serum Laboratories) antiserum, but not by the child's original serum. The strain was still "smooth" by the acriflavine test.

The organism obtained in the next Sonne case was immediately subcultured on to agar plates and a concentrated suspension was prepared. By means of this suspension the agglutination test was made with the serum of the Sonne patients which was available. These were two of the original patients—the child the vicissitudes of whose organism are given above, and two further Sonne patients. In all these cases the agglutination tests gave positive results, the titres ranging from 1 in 16 to 1 in 256. In control experiments with serum from Flexner, Salmonella and non-enteritis patients, no natural agglutinins were detected in dilutions of 1 in 8 or over. This experience shows that suspensions of recently isolated organisms must be used in agglutination tests with Sonne organisms.

*The Value of the Agglutination Test as a Diagnostic Aid.*

Previous experiments have shown that the Flexner type II agglutinins appear in the serum of children infected by one of the Flexner strains, provided that the blood is collected in the period of seven to fifteen days after infection.

The 20 specimens of serum collected within this period from patients suffering from unidentified enteritis were examined for Flexner type II agglutinins. These agglutinins were detected in four of the cases. In none of these were agglutination reactions with Salmonella suspensions produced, so that they can be classified as Flexner cases.

The necessity for using a suspension of a recently isolated strain of the Sonne organism in the agglutination test has been discussed, and although the tests with the above specimens of serum and the standard strain all gave negative results, retesting of the serum with the new, recently isolated strain showed that two of the patients with unidentified enteritis had been infected by the Sonne organism.

DISCUSSION.

The types of Salmonella organisms isolated show a greater variety in the 1943-1944 series than in the previous series, but the prevalence of *Bacterium typhi-murium* is again pronounced and shows the existence of a well-established reservoir of these organisms. The absence of deaths in the 1943-1944 series, the early cessation of diarrhœa and the decreased length of the children's illnesses imply that the strains responsible for the infections were less toxigenic than in the previous epidemic.

The different seasonal incidence of the second series of Salmonella cases suggests that the means of infection was different from the first, when the suggestion was made[6] that the combination of a severe winter, a dearth of cats and the hoarding of foodstuffs resulted in an increase in the rodent population and helped to drive them indoors. In this case the food was probably contaminated by the mice. In the second series the cases occurred in the summer and in the main came from districts containing "pugholes" and factory refuse dumps. These places, being breeding grounds for both flies and rodents, can act as a reservoir of infecting organisms whose "territory" is determined by the flying range of the fly. That Salmonella organisms are common in rodents is evident. Bornstein[10] states that a survey in America showed that over 1% of wild rats examined were carriers of Salmonella organisms. That flies are able to act as vectors of the Salmonella organisms is shown by the work of Hormaeche and his collaborators,[9] who were frequently able to isolate the organisms from these insects. It is obvious, then, that flies, breeding in the same places as the rodents, can contaminate suitable foodstuffs with fæcal matter from infected animals. With such an ideal reservoir from which to obtain the organisms, and a continuous supply of flies to distribute them, there seems little chance that Salmonella gastro-enteritis will become less common in this State.

A further point in favour of the suggestion that the Salmonella organisms were distributed by flies was that the majority of the second series of cases came from the same districts as the majority of the cases of dysentery, which is known to be a fly-borne disease.

The history of the dysentery cases of the 1943-1944 Flexner series suggests that here also the infection was caused by a less toxigenic strain than that causing the previous epidemic. The longer time required before discharge of the 1943-1944 patients from hospital was caused by the improved methods used for isolating the causative organism and was not related to the severity of the disease. It is also possible that the body of the host will make less effort to eradicate a strain of low toxigenicity than a more toxigenic strain, with the result that the low toxigenic strain will remain for a longer period in the host. Under the conditions required for discharge from hospital, this would mean a longer period of stay in hospital.

The vehicles of infection would appear to be milk or milk foods in both the Salmonella and dysentery cases. This is suggested by the age incidence of the patients, which increased in the second Salmonella series to include many who were above the baby-food stage, but whose principal item of diet was still milk food. The seasonal incidence of this and the dysentery series and the distribution of the cases gives one the opinion that the eating of ice-cream in certain districts of Adelaide is not without danger. There is no evidence that these diseases were milk-borne, and it is thought that contamination of the food took place after the food had been prepared.

The use of the agglutination test as a diagnostic aid in cases of gastro-enteritis and dysentery will probably be confined to those patients whose fæces have been examined without result. Tetrathionate broth and desoxycholate media have been shown to be such improvements for the isolation of the infecting Salmonella and dysentery organisms that, under suitable conditions, one can confidently expect to obtain the causative organisms from the fæces.

Insufficient cases were examined to determine the persistence of the agglutinins for lengthy periods after infection; but in the majority of the cases examined the titres of the agglutinins fell in the fourth week of the infection. Reexamination of the results obtained with a previous series of cases[5] shows that of 12 Salmonella patients whose serum contained agglutinins, nine of them lost their immune agglutinins before discharge from hospital. The results also show that eight of these had lost their agglutinins although they were still excreting the infecting organism, whereas the other four patients retained the agglutinins after excretion of the organism had ceased. Evidently the immune agglutinins are not retained for long

periods after infection, so that the absence of these agglutinins does not eliminate the possibility that a person may be a carrier.

Nevertheless, the agglutination reaction can serve some useful purposes. The evidence shows that, in Salmonella cases, the flagellar agglutinins are present most consistently and in the highest concentration. When the blood was collected from Flexner patients in the second week of infection, the Flexner type II agglutinin was found to be present in all the cases caused by this organism and in most of those caused by Flexner type VI. Insufficient cases caused by the other types have been examined to allow of the formation of an opinion on the appearance of the type II agglutinin; but as the above-mentioned types are the commonest in this State, most of the cases will be detected by the use of the Flexner type II organism for the test. The detection of Sonne agglutinins depends on the use of a suspension made from a recently isolated strain which has been subcultured a minimum number of times. By means of flagellar suspensions of local types of Salmonella organisms in the specific phase and one in the group phase, a suspension of the Flexner type II organism and a suspension of a recently isolated Sonne strain, it is possible to detect the majority of cases caused by the Salmonella, Flexner and Sonne organisms. The incidence of these infections can be more accurately gauged by the use of the agglutination test in addition to fæcal examination than by the latter means alone. This has been shown by the examination of serum from 20 patients suffering from unidentified enteritis. The serum of six of these contained Salmonella agglutinins, that of four contained Flexner type II agglutinins, and that of two others agglutinated the locally isolated Sonne strain.

From time to time those who work in this field develop ideas on causative organisms in gastro-enteritis. The agglutination test with the Salmonella and dysentery organisms, as outlined, acts as a check on these infections. If the agglutinins are absent, then the Salmonella, Flexner and Sonne organisms can be eliminated as infecting organisms.

Finally, the agglutination test can give an approximate idea as to the time of infection. If the causative organism is isolated from the child's fæces and the agglutination test made at the same time gives a negative result, it is safe to conclude that either the infection has taken place within the previous week or the child is a "carrier". This has some value in determining whether an infection was obtained in hospital or not. Also, in the case of mixed infections with the above-mentioned organisms, the test can be used to determine the initial infection.

Whether Salmonella gastro-enteritis is a disease which has appeared in Adelaide only in the last few years, or whether the disease has been identified only lately because of the use of newer methods of identification, is difficult to determine. If the former is the case, an increase in the incidence of the disease can be expected in the next few years, whereas if the latter is the case, the statistics of the incidence of infectious gastro-enteritis before 1942, in this State at least, are of little value.


## SUMMARY.

1. The incidence of clinical dysentery, and to a lesser extent gastro-enteritis, has increased in South Australia during the war years.

2. Improved methods have resulted in an increase in the chances of isolating the causative organisms from the fæces.

3. The distribution and seasonal incidence of the infections, the age of the patients, the length of stay of the patients in hospital and the duration of the pathogenic effects of the infecting organisms are compared in two epidemics of gastro-enteritis and bacillary dysentery.

4. The types of Salmonella organisms isolated in the 1943-1944 series were *Bacterium typhi-murium*, *Bacterium kensington*, *Bacterium bovis-morbificans*, *Bacterium newport* and *Bacterium adelaide*.

5. The types of dysentery organisms isolated in the 1943-1944 series were Flexner types II, IV and VI and *Bacterium sonnei*.

6. The reactions of the Flexner type VI strains were similar to those of Boyd's Indian strain (type LXXXVIII).

7. The most prevalent Salmonella strain causing gastro-enteritis in South Australia is *Bacterium typhi-murium*, and the strain responsible for most dysentery cases in this State is Flexner type II.

8. The vectors of the dysentery and Salmonella organisms were probably the flies which, arising from suitable adjacent breeding grounds, such as "pugholes" and refuse dumps, became contaminated with infected fæcal matter from human sources in the first instance and animal sources in the second.

9. The vehicles of infection were probably milk or milk foods.

10. The agglutination test is a useful diagnostic aid, and the suspensions most satisfactory for this purpose are the flagellar suspensions of the most common Salmonella organisms and suspensions of the Flexner type II organism and a recently isolated Sonne strain.

11. For most satisfactory results the serum should be collected in the second week of infection.

12. The titres of the serum decrease after the fourth week of infection.

13. The uses of the agglutination reaction are discussed.


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# THE NEW GUINEA CAMPAIGN.[1]


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EARLY in 1942 many people in Australia opened their atlases and for the first time began to consider New Guinea. Had they referred to a certain geography textbook used in the schools about fifty years ago, they would have gleaned the following exhaustive information:

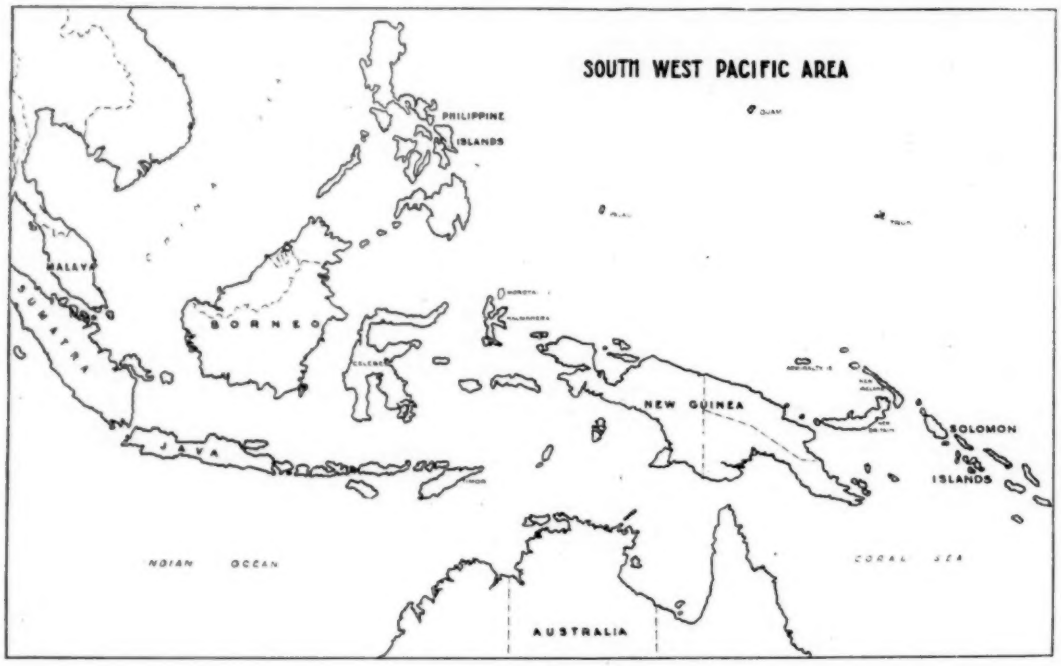
> Papua or New Guinea. A large unexplored island situated north of Australia. The natives are said to be the ugliest race of oriental negroes. They are in general, if not universally, sunk in a condition of the lowest barbarism, and addicted to the most ferocious practices of savage life. The chief products—tortoise-shell, nutmeg, and edible birds' nests. The Dutch have settlements in this island.

Until the Japanese threat to this country few Australians had bothered about the definition or division of this vast island group, lying at its nearest point within a hundred miles of the Australian mainland, guarding our northern approach.

With the exception of Greenland, New Guinea is the largest island in the world, resembling in shape a crouch-

[1] Read at a meeting of the Victorian Branch of the British Medical Association on February 21, 1945.

ing vulture gazing into the west. The predominant feature is a high cordillera backbone along the length of the island, from Vogel Kopf in the north-west to Milne Bay in the south-east. This range, reaching to a height of over 16,000 feet and snow-capped in Dutch New Guinea, can be traced down from Asia through Malaya, Sumatra and Java, and on to the island groups representing mountain peaks far out into the Pacific Ocean. In New Guinea, to the north of this range are fertile plateaux and grassed valleys, such as the Sepik, the Ramu and Markham, and the rich but narrow coastal plains. To the south lie extensive swamp lands around the Fly and other great rivers. To the north and to the east of New Guinea the Pacific Ocean is studded with tens of thousands of island groups. These islands have been formed in varying ways: the volcanic range or peak, such as Hawaii, the visible summit of a great submarine mountain rising from the ocean bed, thousands of fathoms below, with shoals of coral growing upwards from the submerged slopes, here and there breaking the surface of the sea; the coral mass heaved above the ocean by some vast subterranean force and gradually covered with humus and vegetation; and the simple atoll—a narrow ring of sand-covered coral surrounding a central lagoon with a fringe of palm trees. From the air the gradation of greens over these steep coral shoals, sheering off into the blue of great depth, is of untiring beauty. Throughout this area and the large land masses encircling it there still rumbles and bursts forth the volcanic fury of the ages.




MAP I.

To these countless islands, as far south as New Zealand, in the dawn of time came peoples from the surrounding mainlands of southern and eastern Asia. In their quaint catamarans or outrigger canoes, these adventurous pioneers cruised over the area, and the date line drawn along the 180° of longitude to mark the division of time corresponds to an anthropological distinction in their settlement. To the east are the lighter-skinned Polynesians with their black, wavy hair, lovers of peace and beauty; to the west and north the Mongolian strain of dark-skinned Indonese predominates, and to the south the negroid characteristics. After these centuries of settlement, until about 400 years ago, these islands were unknown to Europe.

The silks and satins, the brocades which rustled through the courts of kings and princes, the spices so necessary for the preservation and piquancy of the food, all came from the far unknown east, carried by strange craft or by endless caravans of camels. All routes converged on the shores of the eastern Mediterranean, where the Genoese, the master mariners of the age, loaded their cargoes and sailed into the west.

Inspired by Marco Polo's almost unbelievable accounts of the fabulous story of Cathay, Spain and Portugal in the fifteenth century engaged these Genoese navigators to guide their ships into this land of plenty. Columbus, seeking a western route, blundered into the obstruction of America; but Vasco da Gama, five years later sailing his caravel around Africa, reached India and brought back rich cargoes. Albuquerque's conquest of the Malabar coast established the security of this trade against the Arab dhows, and the Portuguese passed on through the Malacca Straits. Plying their trade still further east, they began to develop this vast East Indian empire. On one such voyage, in 1526, Antonio D'Abreu sighted New Guinea, and on the Portuguese maps of the time is marked "Papoia" or "Os Papuas".

Spain still persisted in the western route. Through the storms below America, Ferdinand de Magellan passed on to Peru and Mexico, and across the Pacific to the Philippines. When a few years later Portugal lost the support of Spain, her hold in the Pacific rapidly weakened and the Dutch seized their opportunity. Cornelius Houtman gained access to the closely guarded charts of the eastern seas and set out to form a Dutch company. A colony was founded at the Cape of Good Hope—the forefathers of the Boers. Pushing eastward, the Dutch made treaties with Japan and China and seized the Moluccas, Java and Amboina, and established the beginning of their wealthy Netherlands East Indies. Sailing across the Indian Ocean before the trade winds, the Dutch mariners were the first to discover the west and northern coast of Australia, and later they came to Tasmania and New Zealand. The Dutch claimed the western portion of New Guinea; but this vast island remained the Cinderella of the Pacific for many years.

During the Napoleonic wars Britain had developed the most powerful sea power in the world, and in 1811 Stamford Raffles seized Java—the gem of the Dutch possessions—and in the name of Britain developed a sound colonization. However, after the cessation of hostilities, the Congress of Vienna returned this jewel to the Dutch and the Queen's "necklace of emeralds" remained intact.

In the latter half of the last century began another scramble for the Pacific islands. France seized New Caledonia and Noumea and moved into Indo-China. Shortly after Bismarck had denied any interest in this area, Germany anexed Samoa, the Bismarck Archipelago and the northern portion of New Guinea. America fought the Spaniards for the Philippines and took Guam. Japan grabbed Formosa, but declined an invitation from the South Australian Government to settle in our Northern Territory.


MAP II.

Alarmed by this obvious menace, Sir Thomas McIlwraith, Premier of Queensland in 1883, cabled the Home Government for authority to annex the area now known as Papua. Before a reply was received a German gunboat sailed into Torres Strait. Sir Thomas made a momentous decision; he instructed the police magistrate at Thursday Island to unfurl immediately the British flag at Port Moresby and annex the Papuan area. Later the reply from England came by letter. The Home Government had accepted Bismarck's further protestation of disinterestedness and repudiated McIlwraith's action. Further appeals reversed this decision, and in 1881 a British protectorate was declared over a vague area comprising the south-eastern portion of the island. Later the boundaries were defined, and when the Commonwealth of Australia was established in 1901, Papua was included in its administration with headquarters at Port Moresby. From that date until March, 1938, no serious efforts had been made for the defence of the area.

Before federation the administration of Papua had been vested in special commissioners and lieutenant-governors appointed by the British Colonial Office. One, Sir William MacGregor, laid the firm foundations of fair play towards the natives. Sir George Le Hunte, who succeeded Sir William, pursued the same policy. He established the native police force and appointed the chief men of the various districts government officers. The seeds of understanding and respect were sown, but during this régime the material development of the territory was practically nil. Certain exploration was carried out and a limited survey was made of resources of the area; but the Royal Commission of 1906, with the subsequent appointment of Mr. Justice Murray as administrator, began a new era.

On the foundations laid so firmly by his predecessors, Murray, the new administrator, built faithfully. In the face of governmental parsimony, certain unscrupulous vested interests and the uninformed clamour of a section of the mainland Press, Sir Hubert Murray in his wisdom steered an unswerving course.

> Not only to develop the resources of the Territory, but also to preserve the Papuans and to raise them eventually to the highest civilization of which they are capable. Not to make the brown man white—but to make him a better brown man than he was before.

The success of this policy, practised among these primitive head-hunters, can be measured not by the pounds, shillings and pence from the material products, but by the magnificent service gvien by these same natives a few years later, when they were called upon voluntarily to aid those who had governed them. This service has been a monument to Sir Hubert Murray and to those who went before him.

Simultaneously with their advance on Malaya, the Japanese left flank was feeling far to the east, and three weeks before the fall of Singapore they landed at Rabaul and consolidated their positions on New Britain and New Ireland. The next objective was Port Moresby, which was to be taken by a three-pronged attack comprising a naval approach from the east, the seizure of Milne Bay as an airstrip and staging area, and an advance over the ranges from the north.

On March 8, 1942, a landing was made at Salamaua, and a few hours later at Lae, the new capital of the Mandated Territory. Finschhaven, on the tip of the Huon Peninsula, was occupied in the next few days. All the villages on the northern coast had been evacuated some time earlier by the white population, with the exception of a few missionaries. These various landings were unopposed except by the Allied air force. From Lae and Salamaua air raids on Moresby became almost daily incidents. The rutsy red side of the *Macdhui*, as she rests on a sandbank in Fairfax Harbour, remains as a memory; but increasing Allied air activity continually hampered the Japanese progress in building up their land bases and seriously damaged their warships and transports.

Early in May, Japanese warships were observed at Tulagi Harbour in the Solomons. To give battle an Allied fleet moved northwards through the Coral Sea, but before direct contact could be made the carrier-borne aeroplanes of the two fleets were heavily in action. For four days this air battle continued; at no time were the opposing ships within a hundred miles of one another, but the losses on both sides were heavy. However, the remnant of the Japanese fleet retired to its base, and any naval hope of moving on Moresby or on the mainland had been frustrated for all time.

On July 22, in the face of heavy Allied bombing, the Japanese landed at Gona and later at Buna—one hundred and twenty miles as the crow flies north from Port Moresby—and moved inland on foot, on horses and on bicycles. To counter this stroke began one of the epic stories in our national history—the battle of the Kokoda Trail. For nearly seven months this thrust and counter-thrust continued, until around Sanananda, at the end of the following January, the last remnants of this Japanese force were annihilated. During this period "those few—those happy few—that band of brothers" who crossed and recrossed the Owen Stanley ranges, tested for months to the limit of physical endurance and not found wanting, became known as the old Kokodonians — pronounced "Koons".

From Port Moresby in times of peace ran one road for thirty miles. Up to the hills went tourists, down from Itiki on mules came rubber. For twenty miles this road wound through the tall grass and stunted eucalypts of the dry belt, then, swerving abruptly around the great Hombrom Bluff, it rose steeply into the Laloki Gorge, past the lovely Rouna Falls, on to a plateau fifteen hundred feet above the sea. Here the road suddenly stopped and a little narrow track, the Kokoda Trail, disappeared into the density of the jungle.

Along the coast wallabies are plentiful, and in the swamps crocodiles and pythons—some nearly twenty feet long; but in the jungle of the mountain there is a strange absence of animals—an occasional small snake, a few small rodents, and about the deserted native gardens some wild pigs, but there are no monkeys. At night the flapping of the flying-fox is a disturbance and the fireflies are a fascination. Some of our Allies were bitterly disappointed that our jungle did not harbour lions or tigers. Few birds are seen, but especially towards dusk many are heard, and their note is generally hard and irritating. The harsh cockatoo is easily identified, and the croak of the bird of paradise, once it has been recognized, is remembered. The natives have a quaint legend about this bird, which they call "Kummel". He had a lovely voice, but was repulsively ugly and could never find a mate. So beautiful was his song that the other birds would often leave off their nesting to listen. At last a meeting was called to solve this problem, and the hornbill, the wisest of all birds, hit on a plan. He suggested that each bird should give to Kummel his most beautiful feather, then, at last attractive, he might find a mate and leave the other birds to the domestic duties. This was done, and Kummel threw his voice to the other birds in payment and flew off to see himself mirrored in a nearby lake. His reflection was so glorious that he cried for joy—but only a hoarse croak came from his throat, and he has croaked ever since. The name "bird of paradise" was given later by the Spaniards, when they declared that his plumage must be the dust and dew of heaven.

In July, with hurried preparation, two unblooded battalions set out over this Kokoda Trail. There were no reliable maps of the route, which wound up and down the Owen Stanley Ranges to Kokoda and on to the northern coast. It had been considered quite impassable to troops; only a few district officers with their native patrols had ever been across. As a military approach to Moresby it had been practically disregarded and was quite undefended. Everything—arms, ammunition, food and supplies of every kind—had to be carried. Natives were voluntarily enlisted, but at that time far too few were available. These natives have been enshrined in song and poetry, almost deified; but they are not gods—they are not even angels—they are men, and splendid men. In marked contrast to the "wogs" of the Middle East, they are cleanly and modest in their habits. They dearly love some article of army clothing. In the dripping heat of the jungle they proudly wear a thick khaki jumper, or cramp one splay foot into a tough army boot designed for the other side. Gladly would they carry a discarded Japanese bicycle without springs or tyres through half a mile of mud for the privilege of riding it over a hundred yards of rough, rattling corduroy. It was not their war. For centuries they had lived their simple village lives, gardening in the hills, growing their yams, their taro and pawpaw, bananas and sugar, or fishing along the coast and growing sago and coconuts. Only from an aeroplane can the existence of the hundreds of little villages be appreciated. During the last few years their fierce inter-village warfare has almost died out, and the head-hunters, distinguished by their necklace of hornbills, are mostly old men. When the island was invaded many natives fled to the mountains. Some remained or were captured by the Japanese and worked for them. The natives had no choice. The Japanese brought hundreds of Rabaul boys and coolies from Korea, but many escaped later to our lines and worked for us.

When the white population was evacuated from New Guinea, certain planters, district officers and other civil servants were retained and formed into the Australian New Guinea Administrative Unit—"ANGAU". From long experience these men had invaluable local knowledge of the country and of the natives, and a representative of ANGAU was attached to each army unit. He alone directly controlled the natives. These men spoke the same languages, they appreciated the needs of the natives and their capabilities. In this way the inevitable misunderstandings and interruptions which would otherwise have occurred were avoided. An ANGAU man always moved with a line of carriers, and the problems, inevitable among some hundreds of natives of many different tribes, were almost invariably solved without delay. Over the mountains on a one-man front went this strange column. If they could race the Japanese to Kokoda they would have an airstrip, and the supply and maintenance problem would be solved. But Kokoda was more than one hundred miles away—ten hard days' marching. These raw troops made it—they were first into Kokoda.

This village, set on a low eminence above the Yodda Valley, was the government residence of the district. On most mornings low clouds hid the high surrounding ranges; but when the sun broke through, the play of colours on the huge rubber trees was very lovely. As the troops moved along the track through the gloom of the plantation, the metal studs of their boots drew little streams of white latex from the bruised roots.

Patrols pushing on twenty-five miles beyond Kokoda met a strongly aggressive enemy and fell back, fighting, at Gorari and Oivi, and finally stood at Kokoda against rapidly increasing pressure.

Towards the end of August, the third prong of the Japanese thrust eventuated, and with the support of their navy another landing was made at Milne Bay, on the eastern extremity of the island. This convoy had been sighted two days previously by a reconnaissance plane and the local force was prepared. This consisted of a brigade which had seen service in Tobruk, and an untested brigade. Side by side, splendidly supported by the Allied air force, these troops fought the Japanese in their tanks back through the swamps of the jungle under appalling conditions of heat, rain, mud and malaria. For the first time

in this war the Japanese land forces were turned back, losing heavily in men, supplies and equipment. The blasted stump of a coconut palm bears an inscription which marks the limit of this Japanese exploitation.

In support of the hard-pressed force at Kokoda an Australian Imperial Force brigade, less one battalion, had moved over the ranges, and again the supply problem became acute. The possibility of aeroplanes' landing at a suitable plateau in the mountains had been anticipated, but this proved impracticable, and dropping from the air was the means used to supplement the meagre train of carriers. Under the conditions of those early days air dropping from the "biscuit bombers" was hazardous. There were no parachutes, and the recovery was not satisfactory. As this new force approached Kokoda, the depleted units which had held the village against the full force of the Japanese advance had fallen back to the hills. Here in the valley of the Eura Creek, about Isurava, a day's march from Kokoda, the force consolidated—two fresh battalions and the remnants of those who had been fighting against a Japanese division. In jungle fighting between equally armed and equally aggressive enemies, ability to outmanœuvre will generally rest with the greater numbers, and the Australian troops were outmanœuvred. Frontally up the track from Kokoda, along the ridges above and across the valley, pressed the Japanese. Only when the ring had almost closed did the men withdraw with their casualties from battle and sickness. From diaries taken later from the Japanese dead, it is certain that this retiring force inflicted many times its own losses.

Early in September the brigade withdrew, heavily outnumbered, but never defeated, fighting day and night, denying every mile until almost surrounded. This most difficult of military operations in mountainous country continued for nearly four weeks, until the Japanese advance was finally halted and turned back at Ioribaiwa.

There was but one axis of withdrawal—a mountain track which defies adequate description. Imagine an area approximately one hundred miles long; crumple and fold this into a series of ridges, rising higher and higher until seven thousand feet is reached, then declining again to three thousand feet; cover this thickly with jungle, short trees and tall trees tangled with great entwining savage vines; through the oppression of this density cut a little native track two or three feet wide, up the ridges, over the spurs, around gorges, and down across swiftly flowing mountain streams. Where the track clambers up the mountain sides, cut steps, big steps, little steps, steep steps, or clear the soil from the tree roots. Every few miles bring the track through a small patch of sunlit kunai grass or an old deserted native garden, and every seven or ten miles build a group of dilapidated grass huts as staging shelters, generally set in a foul, offensive clearing. Every now and then leave beside the track dumps of discarded, putrefying food, occasional dead bodies and human foulings. In the morning flicker the sunlight through the tall trees, and flutter green and blue and purple and white butterflies lazily through the air. After midday and throughout the night, pour water over the forest, so that the steps become broken and a continual yellow stream flows downwards, and the few level areas become pools of putrid mud. In the high ridges about Myola, drip this water day and night softly over the track through a fœtid forest, grotesque with moss and glowing phosphorescent fungi.

Such is the track which a prominent politician publicly described as being "almost impassable for motor vehicles", and such is the route to be covered for ten days from Deniki to Ilolo. Along this track, day after day, the walking sick and wounded passed and plodded, those too desperately ill to stand being carried by native carriers, with improvised stretchers, one or two blankets lashed with native string or vine to two long poles spread by stout traverse bars, as many as eight or ten native bearers would carry day after day. To watch them descend steep, slippery spurs into a mountain stream through the water swiftly swirling around the slippery boulders, then up the steep ascent beyond, was an object lesson in stretcher-bearing. They carried stretchers over seemingly impassable barriers, with the patient reasonably comfortable. The care which they showed the patient was magnificent. Every need which they could fulfil was tended. If night found the stretcher still on the track, they would find a level spot and build a shelter over the patient. They would make him as comfortable as possible, fetch him water and feed him if food was available, regardless of their own needs. They slept four each side of the stretcher, and if the patient moved or required any attention during the night, this was given instantly.

As for the walking sick and wounded, absolute ruthlessness was essential. Those alone who were quite unable to struggle or stagger along were carried; but frequently men against their will had to be ordered on to a stretcher. There was practically never a complaint nor any resentment. From each staging post at dawn, the walkers, the lame and the halt, were set upon their way, while the native bearers were assembled for their tasks. Late each afternoon and far into the night each staging post would receive its casualties. These would be fed, sheltered and tended until dawn, then on again.

The courage and cheerfulness of these casualties were wonderful—beyond praise—sometimes almost incredible. One soldier with a two-inch gap in a fractured patella, splinted by a banana leaf, walked for six days and arrived at hospital in good condition. That no known live casualty was abandoned—that of the many hundreds brought out during these weeks only four died subsequently in hospital—is a magnificent tribute to the fitness and the fortitude of these men. Time and rain and the jungle will obliterate this little native pad; but for evermore will live the memory of weary men who have passed this way, ghosts of glorious men that have gone, gone far beyond the Kokoda Trail.

The Japanese reached the village of Ioribaiwa, a commanding position less than thirty miles in a direct line from the coast. South, on the Imita Ridge, a day's march nearer Moresby, stood a fresh Australian Imperial Force brigade with another veteran brigade in close support. Through these fresh troops withdrew the weary men who had fought back over the mountains. The retirement stopped; the Japanese were halted and began to build defences with logs and vines from the jungle. They were not only halted, they were turned, and back over that dreadful track they fled, abandoning food and gear and dead, leaving behind miles and miles of stench.

On pushed our two brigades—Ioribaiwa—Nauru—Menari—Efogi—Kagi—Myola; then at nearly seven thousand feet, on the crest of the mountains, the Japanese turned again above Templeton Crossing, at a forking of the track. But this time they were outmanœuvred—they were outfought. The strange silence of that eerie rain forest was shattered by the crack of weapons and the crunch of mortars, as the enemy was driven down the other side of the mountain. He stood again at Alola, but from the high ground over the river he broke before a bayonet charge, and the way to Kokoda was again open.

On November 2 the division commander issued the following message:

> Occupation of Kokoda is expected our tps 2 Nov., congratulations to you and the fine tps under your comd for their rapid adv., you have made under shocking conditions which incl hunger (.) the enemy is beaten (.) give him no rest and we will annihilate him (.) it is only a matter of a day or two (.) tighten your belts and push on (.) all informed.

On that day divisional headquarters entered the village; the desolation of a few charred poles on the edge of the rubber was all that remained, but bravely some blue larkspur and bright phlox were in flower among the reds and yellows of the tough crotons and the fragrant frangipani. Twenty-five miles further on, the Japanese stood in strength on the spur at Oivi and Gorari, and for a few days the division paused while aeroplanes came down from the first break in the clouds until the valley closed in again, bringing in supplies and taking out the casualties. For the first time in weeks the troops tasted bread and many were violently ill.

The Japanese made determined efforts to land reinforcements at Buna, but each time they were defeated from

the air. For seven days the enemy fought fiercely about Oivi, but he was finally and completely routed by an outflanking move. At Gorari more than nine hundred Japanese dead were counted, and the remnant fled back to the northern coast. Not even at Wairope, where the Kimusi River is nearly three hundred feet wide and flows in a twelve-knot current over ugly boulders, did they stand. Many were drowned, and the Japanese commander, General Horari, lost his life as he tried to cross the river. Our bridge-building and crossing were uninterrupted, and in three days the brigades were across; each pushed on by one of the two tracks that led to the coast four days away. Meanwhile an Allied force had moved by air and sea to the northern coast east of Buna, and was closing in, outflanking the enemy base. Then for two months was fought the concluding phase of this campaign. The enemy, penned at last at Gona, Sanananda and Buna by our encirclement, cut off from reinforcement or escape by sea by our air superiority, turned at bay with a ferocity, a fanaticism almost beyond belief.

From Milne Bay was brought by sea the Australian Imperial Force brigade, and together with the American troops they attacked the Buna position, defended by bunkers and earthworks of great strength and protected by a perimeter of sago swamps. Bitterly, yard by yard, this position was cleared, until the whole of the Japanese left flank was in our hands.

Further up the coast, for four weeks, brigade after brigade battered at Gona, and by a strange justice victory finally came to the remnants of the brigade which had been driven back over the mountains three months before. The finale at Gona was ghastly. Penned in the small mission area extending about one hundred and fifty yards from the sea and about a quarter of a mile along the coast, the Japanese refused to surrender. They had no possible hope of breaking out or of receiving help or supplies. They were bombed, shelled and mortared day and night. The last resistance came from a strongpost under the gnarled roots of a large tree. For two hours this post fought off all attempts at capture, and only when the seven occupants were dead was the battle over. Then it was understood why many of the Japanese had worn gas masks. No attempt had been made to bury the dead. What had been men and what had been pieces of men were rotting over the ground or else had been built into the defences. What had been a mission station was a shambles, but untouched stood a large white wooden cross, a silent symbol of all this sacrifice. Down on the beach, a narrow strip of black sand, were two recently dead Japanese, their toes by the triggers of their rifles.

A few days later a small patrol encountered three unarmed Japanese wading ashore around a nearby point. The corporal called to them to surrender, but they came on against his well-armed troops. When the leader was almost up to him the corporal ordered him to halt, making his meaning quite clear by a gesture with his rifle. The unarmed Japanese threw himself on the weapon and, before he was killed, had bitten a piece of tissue about the size of a florin from the corporal's face. On another occasion a Japanese casualty, badly wounded in the abdomen, was brought into an Australian field ambulance. He was operated upon and seemed to be making good progress. Three nights after the operation he was being given a drink when he suddenly nearly severed the orderly's finger with his teeth. Both these incidents were recorded by photographs.

Buna on the right flank and Gona on the left had been captured; there remained the final base about Sanananda. A fantastic situation developed. A road block was established behind the Japanese forward position and further forward still another block, so that anyone passing down the mile of jungle track, had he survived, would have passed through an Australian area into a Japanese position, then into an Australian and an American perimeter at the first road block. Again more Japanese, then another small Australian position, and finally the strong Japanese base leading to the coast. In maintaining these various positions each enemy went around or through the other's territory with inevitable clashes. Finally, with all the power that could be applied from these fast dwindling units, the last resistance was crushed, and for the first time we had control of airfields on the northern coast.

Further inland to the west was the valuable airstrip at Wau, still in our hands. If this was lost, the value of the Buna area would be to some extent neutralized. From Lae and from Salamaua the Japanese were slowly infiltrating up through the difficult country that rose steeply from the coast towards the rich plateau four thousand feet above. Air provided the only access to Wau from the south, but the heavy mantle of clouds made the approach uncertain. As the Japanese closed in on Wau in January, 1943, the area was densely shrouded in white, and for days the aeroplanes were unable to get through. Then, dramatically, as the enemy moving by an unmarked track came to the edge of the airstrip, the clouds lifted, more than fifty transports were rushed in, and as they came to the ground the guns were dragged out and immediately opened fire. Wau was saved. For nine months the drive to the coast went on—the "Battle of the Ridges", maintained by carriers and "*kai* bombers". A mixed force—a seasoned Australian Imperial Force brigade which had been represented in every campaign fought by the Australian Imperial Force, in Libya, Greece, Crete, Syria and New Guinea, and another brigade—fought the Japanese down this dreadful country. As they approached the coast an Allied force landed below Salamaua at Nassau Bay and pushed westward, an operation similar to the successful manœuvre that captured Buna. Together these troops seized Salamaua, or what had been that town; nothing beyond a scarred airstrip and a twisted wireless pole remained of this lovely place.

Coincidentally with the final attack a strong force was moving on Lae at the head of the Huon Gulf. For the first time since Gallipoli an Australian division carried out an amphibious operation. One brigade from Wau pushed north along the coast, one division landed some miles to the east of Lae at the Hopoi Mission and the Busu River. Another division, preceded by paratroops which seized the airstrip at Nadzab, landed from the air in the Markham Valley, some thirty miles to the west of Lae, and was joined by an attachment which had flown into Tsli Tsli, south of the Markham. Both divisions converged on the town, but the air-borne division won the race by a few hours. Of Lae, the capital of the Mandated Territory, portion of the hangar of Guinea Airways and about two-thirds of the ice-works were all that remained. Every other building had been bombed to bits. With Lae safe, these divisions turned outwards; one division turned westward, dashed up the Markham Valley, capturing Kaipit and Goussap, and went on to Dumpu, one hundred and fifty miles from Lae.

To appreciate the Markham Valley, fly about five hundred feet above the ground in the early morning. Unless you are partial to containing most of your abdominal viscera in your thorax, avoid that brilliant and well-known pilot from Kansas who cannot resist the so-called thrills of "stunting" in a transport aeroplane. From the air, the mouth of the Markham is visible for miles as a yellow blot in the blue of the Huon Gulf. Along the last few miles of its course the river splashes in braided streams among banks of silver-grey sand fringed by jungle, a tangle of tall trees and sago swamp. Suddenly the jungle stops. To the south is a gem of a lake in the crinkled setting of an old crater; to the north the abrupt hills climb to the Finnisterre Range, six thousand feet above. A small clump of jungle represents the site of Nadzab, where the paratroops seized the airstrip. Beyond Nadzab the beauty of this rich valley is apparent. Carpeted with waving kangaroo grass, the valley, varying from three to five miles in width, is seared by the grey waters of many streams, the floods marked by a series of low grassed terraces, stepping out to the foothills of the high, watchful mountain ranges on either side. Cover is scanty. Little coconut and banana groves around low grass huts mark the villages. As the valley swings towards the north, beyond Kaipit, the grassed flats seem to melt into the sky a hundred miles away.

Looking down at the streams as they chase from the hills, one is suddenly aware that the water is flowing north-

west. There is no obvious watershed, no apparent design or geographical determination; we have left the Markham and are over the valley of the Ramu, the finest tributaries of these two rivers being only a few feet apart.

When the white population was evacuated from Madang early in the Japanese advance, a party moved down through Bogadjim across the Ramu Valley to a native valley high in the Bismarck Ranges. From the villagers who had not been exposed to malaria, two hundred and fifty-two carriers were collected and the party moved into the Ramu Valley again, down the Markham and up the Wompit Valley to another village where the carriers were dismissed. They returned to the village in the ranges again and were absent from their homes for about six weeks; but it is recorded that in this time one hundred and sixty died of malaria. "*Ramu*" in the native language means "death".

At the head of these valleys, caretakers of the huge natural airstrip, the division was established at Dumpu with headquarters in a lovely grove of coconuts, betel nuts, wild plums, bananas, pawpaws and tapioca, in full sight of the impotent Japanese on the spurs to the north. With the final capture of Shaggy Ridge the whole valley was secure, and the way was opened for the advance on Madang and northwards. To climb this ridge at one's leisure was an ordeal; to fight and capture the position was magnificent achievement.

In the meantime the other division had carried out another amphibious operation against Finschhaven. On narrow strips of sand at Scarlet Beach and Siki Cove, just south of the Song River, a brigade had landed and pushed inland against heavy opposition. An advance to the south secured Finschhaven and its harbour, and the brigade joined with a battalion from Lae moving around the coast at Langemak Bay. But the Japanese held the high ground and the commanding position of Sattelberg, which overlooked the whole area. The remainder of the division was brought up just in time to smash a determined Japanese counter-attack, the operation order of which had been captured. The Japanese intention was to drive down from Sattelberg while a force was to move in by sea from the north on to our Scarlet Beach. He succeeded in infiltrating down the Song Valley, almost to the coast, but his barges were smashed as they neared the shore and the thrust was turned. Supported by tanks and from the air, a brigade pursued the enemy up the narrow mountain road and defeated him finally around the remains of the Sattelberg Mission. Another brigade severed his communications at Wareo, to the north, and as a coherent force the Japanese in this area ceased to exist. The remnants were hounded up the coast or driven into the hills. By a series of land and sea movements through Sio and Saidor, the Allied troops herded the fugitives from the whole peninsula, by-passing groups along the coast. Allied landings were carried out on New Britain, about Cape Gloucester and Arawi, and air bases were constructed. By these operations relief or assistance to the Japanese troops remaining in New Guinea, New Britain and New Ireland and the Solomons became impossible.

Beyond these encircled groups the Allies passed on to the various islands leading like a crazy pavement to the Philippines, and now at last this vital group has been captured. Living in the hills behind strong defences, growing their own food and well supplied with munitions, some thousands of Japanese still held out, and the vitally important and terribly difficult task of eliminating them is now being carried out most gallantly by Australian forces.

### Conclusion.

It is easy to be too close to anything really to see it, and a distorted picture—a picture out of all perspective—is often obtained during battle. An attempt has been made to give the broad picture rather than a mosaic of details, which at the time seem so important and block the view. Units and personalities have been purposely omitted, because as an individual no one really matters.

Throughout military history many campaigns have been decided months, sometimes years, before hostilities have ceased. Waterloo was decided three years before, when Napoleon lost all his cavalry in the disastrous Russian campaign. The result of the Boer War was settled at Paardeberg, two years before peace. The Battle of the Marne turned the last Great War. In New Guinea, although bitter fighting still continues, the decision was reached with the capture of Buna and Gona. The series of spectacular successes in the south-west Pacific area during the last eighteen months was made possible by the blunting of the Japanees spearhead in the Battle of the Coral Sea, the Japanese disaster at Milne Bay, and the epic struggle over the Kokoda Trail. All of these in turn were made possible by the combined forces of two allies and by the highest team work of navy, army and air forces of Australia and America.

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## PRESCRIBING IN THE METRIC SYSTEM.

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THE weights and measures used in prescribing and dispensing are unnecessarily complex, and while it is not difficult to obtain a working knowledge of them, they do cause the beginner a good deal of trouble. The British Pharmacopœia recommends the use of the Imperial system, which has the advantage of identity with the weights and measures by which drugs are bought and sold. Custom has, however, settled on the use of the apothecaries' system, and the introduction of some of the newer drugs has given an indication that the metric system has made some appeal for recognition. The metric system, almost universally employed in scientific medicine and pharmacy, has not yet been legalized in all Australian States, and if a prescription is written in this system it has to be transposed into the Imperial system before it can be dispensed. Not only is this wasteful of time, but it opens up the possibility of error. There are signs that this position will shortly be changed by the legalization of the metric system on a Commonwealth basis.

The British Pharmacopœia has long urged prescribers to use the metric system in medicine, and except for the statement of doses, uses no other throughout the volume. It has gone some way to help in simplification by confining its recognition to only two units of weight that are likely to be used in prescriptions, the gramme and the milligramme. It has also provided the prescriber with simple conversion factors for doses. It could do more, it would seem, if, instead of expressing doses, however small in decimals of a gramme, it used the smaller unit the milligramme for such doses. For example, the dose of a substance stated as 0·001 gramme would be more clearly understood if it was expressed as 1·0 milligramme. In common practice we do not think of or use the term 0·06 yard, but we use the smaller unit, the inch, for this purpose.

The requirements for the introduction of the metric system into medicine are few and simple. First of all, it seems useless to try to reconcile the metric and the present systems. We cannot adapt them to each other, and while retaining simplicity in one, obtain it in the other. There must be a definite "swing over". This can be done by the publication in parallel columns, as is done in some hospital pharmacopœias, of prescriptions which are therapeutically identical, although they do not correspond numerically or analytically. This is done by using the therapeutic conversion factors provided by the British Pharmacopœia for this purpose. The prescriber may then choose which system he desires to use, and the prescription will be dispensed in that system. In such a case there can be no legal dispute as to its accuracy.

Before an example of such prescriptions is given, the weights and measures that are necessary should be studied. These are as follows:

*For Solids.*

Gramme ..... abbreviation G.
Milligramme ..... abbreviation mgm.

*For Liquids.*

Millilitre or mil ..... abbreviation mil.
Millimil ..... abbreviation mlm.

These terms require little explanation. The abbreviation for gramme (G.) is recommended because "gm." might be misread, being similar to "grn." for grain. The millilitre is now firmly established for what was formerly termed the cubic centimetre (c.cm.) and is a more accurate expression than the latter. The term "millimil" has been suggested for the volume equivalent to a milligramme of water. The abbreviations used are consistent, compact and easily remembered, as I have found by experiment on students of medicine and pharmacy.

The therapeutic factors enjoined by the British Pharmacopœia for the conversion of doses are as follows:

*Imperial to Metric.*

| | |
|---|---|
| Grains to grammes .. ÷ 15 | Grains to milligrammes × 60 |
| Minims to mils .. .. ÷ 15 | Minims to millimils .. × 60 |

*Metric to Imperial.*

| | |
|---|---|
| Grammes to grains .. × 15 | Milligrammes to grains ÷ 60 |
| Mils to minims .. .. × 15 | Millimils to minims .. ÷ 60 |

An example of the use of these factors is as follows:

| *Imperial System.* | | *Therapeutic Metric Equivalent.* |
|---|---|---|
| Ammonium carbonate 5 grs. ..... | × 60 | Ammonium carbonate 300 mgm. |
| Tincture of squill 10 min. ..... | × 60 | Tincture of squill .. 600 mlm. |
| Camphorated tincture of opium 30 min. .. | ÷ 15 | Camphorated tincture of opium ..... 2 mil. |
| Syrup of tolu 60 min. .. | ÷ 15 | Syrup of tolu ..... 4 mil. |
| Infusion of senega to ½ fl. oz. ..... | ÷ 15 | Infusion of senega .. to 16 mil. |

It will be seen that these factors avoid the use of decimals altogether, and this is desirable. Probably, when familiarity permits, the use of the milligramme will merge into the use of grammes.

The volume to which such a mixture as the above is diluted is not important and must be a matter of compromise. It is suggested that, although the volume corresponding to one fluid ounce is 28·4 mils, it would seem preferable to adopt a number that is easily divisible by two, four and eight and bears a simple relationship to the usual domestic measures which are still used for the administration of medicines. For this reason one fluid ounce, two tablespoonfuls, is taken as 32 mils. If this is done the corresponding domestic measures fall into line in a simple manner, as in Table I.

TABLE I.

| Domestic Measure. | Approximate Metric Measure. |
|---|---|
| Teaspoonful .. .. | 4 mils. |
| Dessertspoonful .. | 8 mils. |
| Tablespoonful .. | 16 mils. |

The bottles that would be used for dispensing such prescriptions need give us little concern. It is not anticipated for a moment that prescribing in the metric system will be compulsory, and there is sure to be an intermediate period which will give manufacturers time to produce suitable bottles. It is important to realize that there is no advantage, but rather the reverse, unless doses are prescribed in multiples of ten. The attempt to graft metric weights and measures on to a sixteen dose system would lead to difficulties and should be avoided; nor would it be feasible to prepare preparations for external use, except in multiples of 10 or 100 grammes. Intermediates, such as 15 doses or 15 grammes of an ointment, would not be too difficult, but this does not apply to 12 or 16. Table II and Table III give a summary:

TABLE II.

*Medicines for Internal Administration (Mixtures, Linctuses, Syrups).*

| Basis for the Patient. | Dosage. | Capacity of Bottle. |
|---|---|---|
| Teaspoonful .. .. .. | 10 doses of 4 mils.<br>20 doses of 4 mils. | 1·5 ounces.<br>3·0 ounces. |
| Dessertspoonful .. .. .. | 10 doses of 8 mils.<br>20 doses of 8 mils. | 3·0 ounces.<br>6·0 ounces. |
| Tablespoonful .. .. .. | 10 doses of 16 mils.<br>20 doses of 16 mils. | 6·0 ounces.<br>12·0 ounces. |

TABLE III.

*Preparations for External Use.*

| Preparation. | Dosage. | Capacity of Vessel. |
|---|---|---|
| Lotions, gargles, liniments .. .. | 20 mils.<br>50 mils.<br>100 mils.<br>200 mils. | 1·0 ounce.<br>2·0 ounces.<br>4·0 ounces.<br>8·0 ounces. |
| Drops (eye and nose) .. .. .. | 10 mils.<br>20 mils. | 0·5 ounce.<br>1·0 ounce. |
| Ointments *et cetera* .. .. .. | 10 grammes.<br>30 grammes.<br>50 grammes.<br>100 grammes. | 0·5 ounce.<br>1·0 ounce.<br>2·0 ounces.<br>4·0 ounces. |

In these 10 dose bottles there would be a slight waste space of 2, 5 and 10 mils respectively. This might impress the patient with the care and accuracy used by the pharmacist. It might, however—and I am told this is more probable—induce the patient to think he had been deprived of a little of his medicine. But, as has previously been mentioned, the supply of metrically graduated bottles would soon follow the demand.

## FLUID BALANCE IN SCRUB TYPHUS.

By RODERICK ANDREW,

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(From an Australian General Hospital, Australian Imperial Force.)

EARLY in 1944 an outbreak of scrub typhus occurred in an Australian brigade involved in beach manœuvres in North Queensland. About 75 men were infected, 19 of them being admitted to this hospital. The clinical features in no way differed from those observed by myself in cases of scrub typhus in New Guinea, and admirably described by Williams, Sinclair and Jackson. Only one man died of the 75 infected.

It was noticed in this small series that oliguria occurred in the more severe cases, and that diuresis set in about the time of clinical improvement. In some of the milder cases this phenomenon was observed.

The details of fluid balance in the cases called "severe" are set out in Table I. Ten of these patients contracted their infections on the same day, but the patient in Case XI, although infected in the same area, was admitted to hospital two months later than the others.

The symptoms mainly considered in assessing the severity of the infection were the degree of drowsiness and the duration and intensity of fever. These men were febrile

TABLE I.

| Base Number and Patients' Initials. | Before Diuresis. | | Day Before Diuresis. Fluid Output. (Ounces.) | First Day of Diuresis. | | Day of Disease. | |
|---|---|---|---|---|---|---|---|
| | Average Fluid Intake, with Range. (Ounces.) | Average Fluid Output, with Range. (Ounces.) | | Fluid Intake. (Ounces.) | Fluid Output. (Ounces.) | When Diuresis Occurred. | When Temperature Fell Below 99° F. |
| I. M.N. .. .. | 125·2 (40–179) | 81·6 (41–135) | 57 | 168 | 148 | 13 | 16 |
| II. B.L. .. .. | 88·8 (70–108) | 28·3 (21–34) | 27 | 59 | 67 | 14 | 15 |
| III. C.Y. .. .. | 91·1 (65–167) | 48·4 (16–72) | 71 | 204 | 119 | 14 | 20 |
| IV. M.N. .. .. | 77·7 (38–103) | 26·0 (16–44) | 26 | 112 | 100 | 10 | 14 |
| V. H.S. .. .. | 88·6 (17–153) | 63·4 (41–93) | 93 | 113 | 104 | 12 | 16 |
| VI. L.S. .. .. | 95·8 (61–139) | 26·0 (17–47) | 24 | 101 | 43 | 14 | 15 |
| VII. G.T. .. .. | 91·5 (73–151) | 29·6 (10–50) | 25 | 64 | 69 | 16 | 19 |
| VIII. W.N. .. .. | 92·7 (81–104) | 34·8 (14–58) | 24 | 136 | 70 | 11 | 13 |
| IX. R.N. .. .. | 87·0 (64–114) | 30·0 (18–44) | 20 | 68 | 74 | 14 | 17 |
| X. S.S. .. .. | 117·1 (42–168) | 58·0 (20–111) | 84 | 142 | 121 | 32 [4] | 33[2] |
| XI. T.E.[1] .. . | 111·2 (68–199) | 65·6 (34–99) | 52 | 117 | 146 | 13 | 16 |
| Average .. .. | 97·0 | 44·7 | 45·7 | 116·7 | 96·4 | 14·8 | 17·7 |

[1] Contracted scrub typhus at the same locality two months later.
[2] Included a relapse.

for an average period of 17·7 days (range, thirteen to thirty-three days). All were placed on the "seriously ill" list.

From Table I the following deductions can be drawn for the group: (i) the average fluid intake on the day on which diuresis occurred was 20% higher than the average intake over the previous days; (ii) the average fluid output when diuresis occurred was 115% higher than the average output over the previous days; (iii) diuresis occurred on an average three days before the temperature was consistently below 99° F.

In addition to daily measurement of fluid intake and urinary output, every man's urine was tested for albumin every day, until defervescence occurred. In only three cases was albumin found, and then only as a trace, present for one or at the most two days. No urine specimens were examined microscopically.

No particular attention was paid at the time to the blood pressure, but the results recorded are shown in Table II.

TABLE II.

| Case Number. | Systolic and Diastolic Blood Pressure in Millimetres of Mercury. (Day of Disease in Parentheses.) | |
|---|---|---|
| I .. .. | 130/80 (9) | 124/84 (14) |
| II .. .. | 100/50 (9) | 108/60 (13) |
| III .. .. | 112/60 (9) | 110/64 (14) |
| IV .. .. | 106/68 (7) | — |
| V .. .. | 124/60 (9) | 112/60 (14) |
| VI .. .. | 106/64 (8) | 108/70 (13) |
| VII .. .. | 100/64 (9) | 100/58 (16) |
| VIII .. .. | 108/60 (4) | 110/?[1] (10) |
| IX .. .. | 98/60 (9) | 104/? (15) |
| X .. .. | 90/50 (9) | 100/? (14) |
| XI .. .. | 120/64 (8) | 106/64 (22) |

[1] "?" = could not be determined accurately.

A glance at Table II in conjunction with Table I shows that the second blood pressure reading was taken on the same day as diuresis in Cases III and VII, and on the day following in Cases I and IX. No significant change is evident. The readings throughout the illness tend to be low, especially the diastolic pressures.

### Comment.

The wet season was almost over at the time of this outbreak, but the climate was still hot and humid. The hospital is 2,000 feet above sea level and escapes the extreme humidity found on the coast.

At the time of diuresis there was an apparent deterioration in the patient's appearance. Within a day or two the flesh seemed to melt away, and the gross wasting, previously masked by tissue œdema, stood revealed. In most cases this occurred just before defervescence was completed, or in some cases at the height of the fever. When it occurred, there was in nearly every case a rapid improvement in the patient's subjective feelings. The distressing headache became less or vanished within a day; the clouded mental condition noticeably brightened; the appetite improved and fluids were eagerly sought. Consequently the onset of diuresis in severe scrub typhus is a good prognostic sign, although fever may still be high.

In some cases the output may be astonishing. In Case XI, on the first day of diuresis the patient passed nearly seven and a half pints of urine, while on the second day, when his temperature rose to 102° F., the output was only four ounces short of 13·5 pints. His clinical condition improved rapidly from the first day of diuresis.

The explanation of the oliguria followed by diuresis is not apparent. There are a number of possibilities.

An acute nephritis, the result of rickettsial invasion of the arteries of the kidney, may be thought possible; but there was no evidence of significant albuminuria in the present series, and nephritis, as usually understood, does not occur, even in fatal cases (Williams, Sinclair and Jackson). The function of the kidney may, nevertheless, be impaired by rickettsial infection, even though no histopathological changes are apparent.

Retention of non-protein nitrogen is unlikely to be a deciding factor in the oliguria, since these same workers have shown that, in a series of 32 patients examined, some of them severely ill, 73 milligrammes of urea *per centum* was the highest figure recorded, while in only six cases was the percentage 60 or over.

The evidence given in Table II, although rather slender, shows that, in some cases at least, a sudden and significant rise in blood pressure from depressed levels does not occur. It cannot therefore be argued that a consequent increase in filtration pressure through the kidneys is the main factor in increased urinary output. Moreover, there was no other evidence to incriminate the circulatory system. The heart did not become enlarged in any case, and the rhythm remained regular.

Whether changes in serum protein occur is not known. A few estimations have been made of total protein content, but these were within normal limits. It is possible that a change in the albumin-globulin ratio may account for the fluid retention; but there is no information available on this point, which requires further study. Even if this change was shown to occur, the cause for the diuresis would still not be clear.

Whatever the explanation, it is apparent that fluid retention occurs in severe scrub typhus, and that diuresis marks the end of the worst phase. Coincident with this is pronounced subjective improvement, and within a few days defervescence may be fairly confidently predicted.

These findings reinforce the warnings by other observers of the dangers which beset the intravenous administration of fluids in this illness, since the fluid balance is so gravely upset. Furthermore, the forcing of fluid intake by mouth beyond five or six pints per day has nothing to recommend it.

**Acknowledgements.**

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I am indebted to Major B. A. Baker and Major J. M. Pedler for access to their patients and records.

**Bibliography.**

S. W. Williams, A. J. M. Sinclair and A. V. Jackson: "Mite-Borne (Scrub) Typhus in Papua and the Mandated Territory of New Guinea: Report of 626 Cases", THE MEDICAL JOURNAL OF AUSTRALIA, November 18, 1944, page 525.

# Reports of Cases.

## A CASE OF PNEUMOCOCCAL MENINGITIS SUCCESSFULLY TREATED WITH PENICILLIN.

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AND

B. L. HUGHES,
*Surgeon Lieutenant, Royal Australian Naval Reserve.*

**Clinical Record.**

L.J.Mc., aged twenty-eight years, first presented himself complaining of severe frontal headache and anorexia. His temperature was found to be 102° F., his pulse rate was 100 per minute and his respirations numbered 22 per minute. His bowels were not open. He had no other complaints, and full physical examination including the central nervous system revealed no abnormality. A provisional diagnosis of influenza was made and routine treatment was given. As we were in a malarious area, and the patient admitted to having taken prophylactic "Atebrin" only irregularly, a blood film was made, but no malarial parasites were seen in it.

The next day the patient's temperature was still raised; he complained of some nausea, vomiting and headache. General examination revealed no abnormality, and examination of repeated blood films revealed no malarial parasites. During the following night the patient became semi-delirious; he muttered and moaned, and was not rational when spoken to. He was apathetic and difficult, and some naso-pharyngitis developed. His temperature still remained at 102° F. A full physical examination with special attention to the central nervous system, ears and sinuses revealed no abnormal physical signs. The white blood cells were found to number 9,400 per cubic millimetre, and the blood film appearances were within normal limits. Chemical and microscopic examination of the urine revealed no abnormality up to this time. Quinine bihydrochloride was given as a diagnostic measure, twenty grains *statim* and ten grains three times a day, and within a few hours his temperature fell to normal. This suggested that the disorder was masked malaria.

On the night of the fourth day the patient's temperature again rose to 102° F., and he complained of severe and unremitting headache; he was stuporose and anorexic. Later he became obviously delirious. The white blood cells were found to number 7,500 per cubic millimetre, in the central nervous system again no abnormality was found, there was no neck stiffness, and Kernig's sign was not elicited. The temperature as recorded on the chart now had a marked swinging rhythm. As cultural and agglutination investigation of the blood was not available, and as it now appeared that a hidden purulent focus was present, intramuscular injections of penicillin were commenced, 25,000 units being given every two hours.

Early on the morning of the fifth day the patient's temperature was again normal, but he was still stuporose. Full examination of the central nervous system revealed, as the only abnormality, obviously tiring left superficial abdominal reflexes and a doubtful right plantar reflex. There was no change in sensation of muscle power, but slight neck stiffness was demonstrable. Lumbar puncture was performed, and turbid fluid under a pressure of eighty millimetres was withdrawn. Examination of this fluid revealed that the white blood cells numbered 2,000 per cubic millimetre. Gram staining revealed that these were composed of 80% of polymorphonuclear cells and 20% lymphocytes, and that typical intracellular and extracellular Gram-positive diplococci resembling pneumococci were present. The diagnosis of pneumococcal meningitis was established.

On the sixth and seventh days, although the temperature was still swinging, the central nervous system condition remained unchanged; but an obvious improvement in the patient's general condition had occurred. A second lumbar puncture on the seventh day produced clear fluid under a pressure greater than 120 millimetres; it contained a small quantity of microfibrin and a faint cloud of albumin.

By the evening of the eighth day the patient had had 1,000,000 units of penicillin; his temperature was approximately normal, and as his general condition was good, the administration of penicillin was stopped.

The following morning, however, his temperature was over 103° F.; but apart from severe headache his condition was still good. Lumbar puncture was attempted in three spaces and failed; this was thought to be due to fibrin formation over the old puncture sites. A blood examination showed that the white blood cells numbered 11,500 per cubic millimetre; examination of a film revealed that 90% were polymorphonuclear leucocytes. Examination of the central nervous system showed that all superficial abdominal reflexes were depressed, the left less than the right; right-sided muscle power was slightly lessened, and some asteriognosis of the right hand was present. Penicillin (16,000 units every three hours) was again exhibited.

From this point onwards, the patient's temperature fell to normal and remained so, all abnormal signs disappeared, and his general mentality, speech and reactions were adjudged as normal by men who had been associated with him for over the past two years. His appetite now became normal for the first time. In all a total of 1,400,000 units of penicillin was given.

**Summary.**

1. A case of pneumococcal meningitis is described.
2. The typical lack of signs and symptoms is noted, the only positive findings being headache and anorexia. The absence of central nervous system signs and neck stiffness throughout is particularly noteworthy.
3. Considerable improvement in general condition was shown as soon as penicillin was exhibited. As pyrogen-free fluid was not available till the administration of the last 400,000 units was commenced, some at least of the temperature elevation must be attributed to this cause. He was considered to be suffering from pneumococcal meningitis, but as an X-ray examination of the chest failed to reveal any pneumococcal focus, it is considered likely that the primary focus was in the naso-pharynx.
4. Penicillin could not be exhibited intrathecally, owing to the difficulty in performing lumbar puncture. However, penicillin given intramuscularly produced improvement. This suggests that some at least found its way into the cerebro-spinal fluid.
5. Surgeon Lieutenant-Commander Sewell, to whom we are indebted for seeing this patient in consultation, agreed with the findings, and advanced the suggestion that a pneumococcal abscess of the brain had ruptured into the subarachnoid space; the cerebro-sprinal fluid had been cleared by the initial penicillin therapy, but some local infection of the brain remained, necessitating further penicillin.

**Acknowledgements.**

We are indebted to the Director of Naval Medical Services for his permission to publish this case history.

# Reviews.

## ANÆSTHESIA.

THE sixth edition has appeared of the book known up to the fourth edition as "Handbook of Anæsthetics", by Ross and Fairlie.[1] The fifth edition was edited by R. J. Minnitt, of Liverpool, and contained new chapters on cyclopropane and closed circuit carbon dioxide absorption anæsthesia, "Vinesthene", and therapeutic use of oxygen, helium and carbon dioxide. This sixth edition is by Minnitt and John Gillies, a well-known Scottish anæsthetist. It has additional chapters devoted to the use of trichlorethylene, endotracheal anæsthesia, intravenous anæsthesia and anæsthesia for dentistry. Acknowledgements are made to Major L. B. Wevill for a detailed account of local and regional anæsthesia.

The whole book has been considerably enlarged in both its scope and its size. The name also has been altered from the rather modest handbook and now appears as a textbook. The book itself is excellently got up, well printed on excellent paper and much more fully illustrated than the original. In wartime it is rather amazing that such an excellent product is possible. The general character of the original editions has been retained. The new chapters are for the most part well written, but throughout these newer portions one finds many small contradictions which are at first disconcerting. For instance, on page 55 the following appears: "Anæsthesia carried to the lower border of the second plane is sufficient for all operations, including those in the upper abdomen, but when circumstances warrant it, the skilled anæsthetist may assist the surgeon just a little more by deepening the anæsthesia into the third plane." The next paragraph commences: "To bring the patient precisely into the third plane of Stage III, and to maintain equably this optimal level for upper abdominal surgery, demands from the anæsthetist a standard of skill and clinical judgment which can only be acquired by sufficient experience." Many bald statements are made which at first appear to be controversial, and they later are qualified in much this way. This produces a desire to challenge many statements in the early stages of the book, but gradually the reader becomes used to reading on, and some qualification generally follows.

In the third chapter on anoxæmia, mention is made of the carotid sinus and the carotid body and of the parts they play in regulating respiratory exchange. This section touches only lightly on the physiology of respiration and leaves the impression that the writers are not too clear in their own minds on the subject.

The statement that cyanosis is a manifestation of oxygen lack except in patients who are anæmic, is a confusing way in which to open a description about oxygen want. It is not clearly pointed out that cyanosis is caused by the presence of five grammes of reduced hæmoglobin, and may be present without oxygen want and may not be present in cases of extreme oxygen want.

In the section covering prevention and treatment of anoxæmia, much space is devoted to descriptions of the various ways of correcting pharyngeal obstruction by altering the position of the head and by the use of various oral and naso-pharyngeal airways. There are many pictures of such airways and also of several forms of tongue forceps, all of which are more or less barbarous, but no mention is made of the use of suckers, intratracheal airways or the addition of oxygen and helium to the anæsthetic mixture. In regard to laryngeal stridor, the first advice is to withdraw the anæsthetic—the use of oxygen is mentioned low on the list, but the beneficial effect of carbon dioxide for this complication is omitted.

The chapter dealing with shock is disappointing, firstly, because the impression is conveyed by the authors that this subject is one more for the surgeon than the anæsthetist. The more modern concept surely is that during the preparation of the patient for operation and during the time of the operation and for some time afterwards, the recognition of shock and its effective treatment should be primarily the concern of the anæsthetist. In this chapter too much space is devoted to the discussion of theories of the causation of shock. Crile's anoci-association theories receive attention out of proportion to their present-day acceptance. Three degrees of shock are described and the statement is made that the "surgeon is warned when second degree has been entered". Treatment of shock is very sketchily outlined and the reader is left with the feeling that little of real assistance has been provided for those desiring to undertake the recognition and treatment of shock.

In a description of the stages of anæsthesia a modified chart is adapted from Guedel and the text referring to it appears in small print. As this chart of Guedel's has become the standard used for the recognition of the various stages of anæsthesia, it is a pity that it is not more fully presented and less space devoted to the ocular reflexes. Apart from Guedel's chart the art of interpreting depth of anæsthesia in terms of muscular relaxation and its effect upon respiration receives no mention.

A valuable reference is made to the use of glucose and insulin for prevention and treatment of post-operative vomiting.

The section on premedication is well done, but compared with Australian standards the dosage would appear to be somewhat excessive.

An excellent chapter on posture of the patient is well illustrated with good photographs and is one of the most valuable in the book. It is full of admirable suggestions which might well be adopted in operating theatre routine.

The chapter on nitrous oxide covers the subject very well. It is fully illustrated and describes the use of most types of English gas machines, giving pictures of many.

The section on intravenous anæsthesia gives a very good account of the structure of the various barbiturates and excellent diagrams of the veins of the ante-cubital fossa. The authors, however, convey the impression that the ultra-short-acting barbiturates used intravenously are good only for very minor procedures unless combined with other forms of anæsthesia. A distinct impression of fear of complications is conveyed, and yet little mention is made of laryngo-spasm and no directions are given for its prevention or treatment. Anæsthesia in dentistry is fully and excellently presented with good illustrations, as also is the chapter covering anæsthesia in obstetrics. The discussions on accidents and sequelæ in anæsthesia are little altered, and though adequate in the handbook, hardly attain the standard required in a textbook. The same remarks apply to the presentation of spinal anæsthesia. The new chapter on local and regional anæsthesia is well done, well set out and well illustrated.

The general impressions conveyed by this publication are that it is a most useful and well-presented book of great value to the student and general practitioner anæsthetist. The main criticism is that it falls short of textbook standards in that it does not fully answer many of the more difficult problems which the anæsthetist has to face, and that it devotes a lot of space to contentious theoretical considerations, where the reader might have expected to find more space devoted to full details in recognized treatment and more useful instruction.

[1] "Textbook of Anæsthetics", by R. J. Minnitt, M.D., (Liverpool), D.A. (R.C.P. and S. Eng.), and John Gillies, M.C., M.B., Ch.B. (Edinburgh), D.A. (R.C.P. and S. Eng.), with a chapter on Local and Regional Analgesia by L. B. Wevill, M.B., F.R.C.S.(Ed.); Sixth Edition; 1944. Edinburgh: E. and S. Livingstone Limited. 8¼" × 5¾", pp. 496, with 199 illustrations. Price: 25s. net.

## THE STORY OF THE OTAGO MEDICAL SCHOOL.

NOT so very long ago a certain author of note, one George Bernard Shaw, was gracious enough to come all the way from the other side of the world to pay a special visit to the Dominion of New Zealand; and strange to relate, after venturing so far into the Antipodes, he betrayed no inclination whatever to cross the Tasman Sea and to investigate the potentialities of this great country. The cool indifference of such a great man to what might seem a unique opportunity was a little irritating to the susceptibilities of the Australian people. During the visit, however, he generously condescended to talk to us for a few minutes over the air, and prefaced his remarks by the announcement that he was speaking to us from a place known as Wellington. For our special benefit he was kind enough to describe his geographical position, and to inform us that it happened to be the capital city of our sister Dominion. What really hurt many of those who listened to the broadcast was that the jibe was well merited; but if some of our intellectuals in the medical profession could spare the time to read what Emeritus Professor D. W. Carmalt Jones has written in his book, "Annals of the University of Otago Medical School,

[1] "Annals of the University of Otago Medical School, 1875-1939", by D. W. Carmalt Jones; 1945. Wellington: A. H. and A. W. Reed. 5¼" × 8¼", pp. 286, with 12 illustrations.

1875-1939", it would help to rectify some of our omissions, and would serve as a reminder that we have a good deal in common with New Zealand.

With the exception of two introductory chapters which contain interesting information about New Zealand and its southern-most province, Otago, the bulk of the book consists of a necessarily somewhat dull account made up of the bare historical facts essential to its purpose. In an epilogue Professor Carmalt Jones modestly observes that the "history" of the Otago Medical School could be written in a few pages, and to demonstrate his point he has inserted as an appendix the reprint of an address by Sir Louis Barnett on the evolution of the Dunedin Hospital and Medical School. It is regrettable that the same modesty has deprived the reader of a chance to learn something about the author's own contribution to a very fine achievement.

Since the first hospital was built in Dunedin away back in 1851, phenomenal developments have taken place in the practice of medicine; and it is no wonder that the profession was constantly in difficulties with the lay authorities in its efforts to keep pace with the new ideas. Financial considerations were always the stumbling-block whenever the doctors felt impelled to make demands for better hospital accommodation, new equipment, improved teaching facilities for the students or for the establishment of another department for specialized study and research. And this is how the old, old story is told once again:

> The history of the place is of one continual struggle with monetary difficulties. As has been said, the "sixties" were the boom period in New Zealand, with the gold rush and the very high price of wool, and naturally the opinion commonly held was that all the tomorrows would be as today, and that a period of permanent prosperity had arrived. But here, as elsewhere, booms are followed by slumps; the price of wool fell, the output of gold decreased, the depredations of rabbits became serious, and the land boom collapsed. The university therefore came between the millstones of shrinking revenue and growing expense.

In spite of all the setbacks to its material advancement, it would seem that the Otago Medical School was consistently fortunate in its choice of medical graduates to fill the professorial chairs. Most were men of high academic distinction, strong character and forceful personality; they possessed the qualities necessary to convince the university authorities, the Government and the general public that New Zealand must at all costs be able to provide a sound medical education, and must have modern hospital accommodation in order to ensure a high standard of medical care for the people. The book tells us how these early hopes and ambitions were gradually realized, and how quite a number of medical graduates from the University of Otago achieved fame in other parts of the world.

Professor Carmalt Jones has earned the gratitude of the medical profession throughout the British Commonwealth for his industry in compiling such a careful and complete record of his own medical school. With characteristic modesty he claims that his book can have only a local interest; actually it has a distinct value as a contribution to the history of the medical profession in the Dominions. It is to be hoped that its publication will stimulate others to emulate his example.

The book's weakest part is its binding; but it is all the better for several good portraits of the professors and for some clear photographs of Dunedin medical institutions. Not the least pleasing feature of this production is the inclusion of a few pencil drawings, which in themselves proclaim the author as an artist of no mean order, however reluctant he might be to countenance the suggestion.

# Notes on Books, Current Journals and New Appliances.

## AUSTRALIAN HISTORICAL TALES.

MR. FRANK CLUNE needs no introduction to Australians as a traveller, an observer and a teller of tales, with a style of his own and a keen interest in the history, the present and the future of his country. Three small books from his pen have recently been published. The first, "The Greatest Liar on Earth", deals with the chequered career of Henri Louis Grien, alias Count Louis de Rougement, of over-fertile imagination and improvident habits.[1] The second, entitled "Starlight", puts a slightly different complexion upon the chief character in Rolf Boldrewood's "Robbery Under Arms".[2] The third, "The Forlorn Hope", described by the author as "a sea saga of the sixties", gives an account of a little-known incident that occurred during the early attempts at colonization of the Northern Territory.[3]

These three little brochures are well printed and delightfully illustrated with woodcuts by Allan Jordan. At the moderate price asked for them, they should be well received.

## TWO AUSTRALIAN NOVELS.

"THE LITTLE COMPANY", by Eleanor Dark, is a novel with a purpose.[4] In it the author sets out to show how the upheaval of the second world war affected the lives of the members of an Australian family—and not only the war, but the changing face of society. Mrs. Dark in all her writings has the ability to show the workings of the human mind, and most of the members of this family do some hard thinking. The title of the book must, we take it, refer to the Australian people, who, if the author had her way, would undergo the same thinking process. The title is taken from the following quotation which appears several times throughout the book: "Oliver said: 'I have seen the Saracens; the valleys and mountains are covered with them, and the lowlands and all the plains: great are the hosts of that strange people; we have here a very little company.'" The characters are well drawn—Phyllis the unhappy and well-meaning but pathetic wife, who cannot understand what is going on around her; Aunt Bee, the dear soul who takes everything as it comes and sails through life without allowing anything to touch her; Prudence, the serious daughter, and Virginia, her beautiful but imprudent sister; Gilbert Massey himself, a writer whose mental evolution is so slow and whose solidity is so irritating that the reader wants to shake him; the care-free family of Laughlin—these are some of the people who live in these pages. The lives created for them hold the reader's interest. If here and there the purpose of the book is too evident, if some of the incidents of the war seem rather to be dragged in by the heels, so to speak, and if the end of the book does not come up to the reader's expectations, he will have no reason to complain. By the time he has come to the end he will have sojourned with some human people, and, what is more, he will probably have done some thinking for himself.

Norman Lindsay's "The Cousin from Fiji" has no deliberate purpose.[5] It is a tale set in Ballarat at the end of last century. Here the Domkin family lives under the domination of the grandmother, and hither comes Cecelia Belairs with her daughter, Ella, returning to the maternal home from Fiji. They are received by Cecelia's brother, George, whose beard is a thing of beauty and its owner's pride. The opening chapter describes a ludicrous situation in which Grandma from sheer perversity has shut herself up in a closet in the backyard and the door has to be removed before she will emerge. The story continues with a lively account of the conventional and unconventional behaviour of the several members of the family and their acquaintances. The writing is good. Sex figures largely in the lives of these people; even an old woman of eighty retains her zest in her hunting down of the male, which seems somewhat extraordinary. However, virture triumphs in the end, and, as usual, pride goes before a fall. Although the world would be none the poorer if this book had not been written, it is worth reading, and will entertain the reader in some of his duller moments.

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[1] "The Greatest Liar on Earth", by Frank Clune; 1945. Melbourne: The Hawthorn Press; Sydney: Angus and Robertson Limited. 8¼" × 5¼", pp. 24, with illustrations. Price: 1s. 6d.

[2] "Captain Starlight: Reckless Rascal of 'Robbery Under Arms'", by Frank Clune; 1945. Melbourne: The Hawthorn Press; Sydney: Angus and Robertson Limited. 8¼" × 5¼", pp. 29, with illustrations. Price: 1s. 6d.

[3] "The Forlorn Hope: A Sea Saga of the Sixties", by Frank Clune, 1945. Melbourne: The Hawthorn Press; Sydney: Angus and Robertson Limited. 8¼" × 5¼", pp. 32, with illustrations. Price: 1s. 6d.

[4] "The Little Company", by Eleanor Dark; 1945. Sydney: Collins Brothers and Company Limited. 8¼" × 5¼", pp. 327.

[5] "The Cousin from Fiji", by Norman Lindsay; 1945. London, Sydney: Angus and Robertson, Limited. 8¼" × 5¼", pp. 265. Price: 8s. 6d.

The Medical Journal of Australia

SATURDAY, DECEMBER 15, 1945.

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## PASTEURIZATION AND PROCRASTINATION IN VICTORIA.

THE twenty-second report of the Commission of Public Health to the Minister of Health of Victoria, covering the year 1943-1944, and dated September 26, 1944, was published when 1945 was well advanced. It contained an important statement on the pasteurization of milk supplies. The Commission expressed its satisfaction at the passage of the Pasteurization of Milk Act, 1944 (the correct title is the *Milk Pasteurization Act*, 1943), "even if the recognition of the warnings given by it regarding the dangers of milk-borne infections has been tardy". The Commission pointed out that Victoria was the second self-governing State in the British Empire to set up machinery for the compulsory pasteurization of milk supplies—Ontario, Canada, was the first. All who are interested in the practice of preventive medicine will share the Commission's satisfaction and will realize that the Commission in all probability tendered sound advice to the Government before the measure was drafted. But it is one thing to set up machinery and quite another to start it working. The Commission, like every other health department in Australia, knows this only too well. This is clear from the following two paragraphs that succeed the expression of satisfaction:

> Of course, until the legal machinery provided by the 1943 Act is put into practice by the provision of proper official control of all pasteurization plants existing, and until properly supervised pasteurization plants have been provided throughout the State wherever economically possible, the public will have no guarantee against milk-borne infection except by boiling the milk after delivery.
>
> Milk, as treated in many pasteurization plants today, may consistently fulfil the requirements of pasteurized milk under the Food and Drug Standards Regulations, 1939; but there will be no full safeguard for the public until careful day-by-day checking is done at every plant under the supervision of skilled and responsible Government-appointed inspectors, together with proper laboratory and other tests.

The provisions of the act and the steps that have so far been taken to give effect to them are not without interest, and indeed in the present state of dilly-dally should be made clear. The *Milk Pasteurization Act*, 1943, is intended to apply to (*a*) the metropolis and milk for consumption in the metropolis, and (*b*) any urban district as defined from time to time by proclamation of the Governor in Council published in the *Government Gazette* and milk for consumption in that district. For the purposes of the act a Milk Pasteurization Committee was to be appointed, consisting of (*a*) an officer of the Department of Agriculture, who was to be chairman; (*b*) a person appointed by the Governor in Council who is a member of the Milk Board constituted under the Milk Board Acts; (*c*) the Director of the Veterinary Research Institute of the University of Melbourne; (*d*) a medical officer of health appointed by the Governor in Council from a panel of three names of such medical officers submitted to the Minister by the Metropolitan Sectional Council of the Municipal Association of Victoria. The four members appointed were: Mr. R. J. de C. Talbot, Mr. J. T. Packer, Dr. H. E. Albiston and Dr. J. A. Cahill. The functions of the committee as set out in the act were four in number:

(*a*) to survey the existing facilities for the pasteurization and bottling of milk for consumption in the metropolis;

(*b*) to consider what additional facilities for the pasteurization and bottling of milk are required to make adequate provision for the metropolis;

(*c*) to submit to the Minister a general scheme providing for the pasteurization and bottling of all milk for consumption in the metropolis; and

(*d*) to report to the Minister upon any matters relating to the pasteurization and bottling of milk referred to it by the Minister.

The act stipulated that in its preparation of a general scheme, the Committee should as far as practicable make provision for the use of suitable existing facilities for the pasteurization and bottling of milk, and also that it should make provision for the establishment by municipalities or groups of municipalities of additional pasteurization depots as required. The Milk Pasteurization Committee was entrusted with heavy responsibilities. The act may really be described as a framework on which the Committee might elaborate a worthwhile and efficient scheme; if it was not equal to the task, the whole act would be a failure. But the Committee has done its work well. It was appointed on December 23, 1943, and issued a report to the Minister of Agriculture on August 25, 1944. Since some of the reasons for delay in the functioning of the act appear to arise from a lack of understanding of what pasteurization really means and how it must be carried out and safeguarded, some reference must be made to it. The Committee does this in an effective way in the first part of its report. Pasteurization is not a simple process carried out merely by the heating of milk. "It is a highly technical process, and its efficiency depends on the intelligent use of the apparatus designed not only to heat the milk to the required temperature for a definite time, but also for its rapid cooling immediately after heating. Further, as the prime object of pasteurizing milk is to protect the public from milk-borne diseases, the possibility of re-contamination must be eliminated, and therefore the process is not considered to be completed unless the milk is packed, immediately after treatment, in sealed sterilized containers. A further precaution is the mechanical sealing of milk bottles with a cap which completely covers the lip of the bottle, and protects the pouring edge from contamination." There are two methods for the pasteurization of milk. One is known as the "Holder" method. It is the older of the two, and until recently was the only method officially recognized in Great Britain. In this method the milk is maintained at a temperature of 142° to 145° F. for a

period of thirty minutes. In the other, the "high temperature short time" method, the milk is heated to a temperature of 162° F. and held at that temperature for a period of at least fifteen seconds. In both methods the milk is cooled quickly in special apparatus to a temperature not exceeding 40° F. From this short statement alone it will be clear that considerable skill and experience are needed if the process of pasteurization is to be effective. More than this, milk is an ideal culture medium for micro-organisms, and two facts in connexion with pasteurization need to be emphasized in any statement made to the public. The first is that pasteurization will never make dirty milk clean. In other words, no laxity can be allowed in the dairy farm because pasteurization is to take place at an urban centre, and the dairy farmer remains in all circumstances a guardian of the public health. The other fact is that pasteurization confers no immunity on milk—it can be contaminated after pasteurization just as easily as before the process.

Beyond stating that 91,000 gallons of milk are supplied to the metropolis every day, we do not propose to give details of the problem as set out in the Committee's report. One of the significant sections is that in which a survey of existing facilities for pasteurization is recorded. There are in the area concerned a number of dairies in which pasteurization plants of various types have been installed. The Committee found that in some cases the management was not seized with the importance of attention to detail, without which a plant cannot be efficiently operated. At eight dairies the pasteurizers were not in regular use; in others the capacity of the pasteurization and bottling plant was inadequate to deal with the volume of milk that was being distributed. Very few of the premises or existing plants were of such a type that they could be redesigned or extended to operate as wholesale units; in most cases the facilities for wholesale trade were quite inadequate. Perhaps most surprising of all is the statement that although all the pasteurizers were equipped with automatic recording thermometers, some of the owners did not appear to appreciate the function or necessity of the apparatus. Finally, the principles underlying the cleansing, sterilization and filling of milk bottles were not generally recognized, and the equipment, with few exceptions, was of such a type that the treated milk was exposed to recontamination because of the human handling necessary during the cleansing, sterilizing and filling operations. Only one of the dairies was found to be equipped with a machine which sealed the milk bottle with a cover top. It is not surprising, in the face of these discoveries, that the Committee came to the conclusion that the majority of pasteurizer-equipped dairies were entirely unsuitable for inclusion in a general scheme. The occasion for surprise would be the drawing of any other conclusion. The position of a few pasteurizer-equipped dairies "of special merit", whose proprietors "have established a reputation for efficient management", is unfortunate. The Committee has been compelled to come to the conclusion that they cannot be included in a general scheme. The reasons for this conclusion include questions of legal powers, wholesale and retail trading and other matters too numerous to be summarized here. The basis of the general scheme recommended by the Committee is the division of the municipalities scheduled in the act into two groups and the establishment in the area of each group of a pasteurization depot of modern design, equipped with a plant capacity to treat, on a double shift basis, up to 55,000 gallons of milk every day. Of this amount 40,000 gallons would be bottled for retailed trade and 15,000 gallons would be supplied for semi-wholesale distribution in sealed sterilized cans. The Committee defined the groups of municipalities and stated where it thought the depots should be established. The Committee also dealt with the creation of a central authority to control the whole undertaking, and it made reference to compensation to be paid to owners of dairies whose pasteurization plants would not be used. In view of the poor way in which the existing pasteurization plants appear to be understood and appreciated, it is clear that control—continual supervision and instruction—will be just as important as the devising and setting up of a proper scheme.

No sooner had the Committee's excellent report appeared, than criticism was made by several organizations and associations. The demand was so insistent that Cabinet appointed a subcommittee of three members, including the Minister, to deal with the matter. This subcommittee eventually decided that the number of depots should be increased from two to six. After the Milk Pasteurization Committee had grouped the municipalities in a manner suitable for the establishment of six depots, the municipalities were advised of the details. This was done in accordance with two clauses of the act which seem to open up a great avenue for delay. According to one of these a municipality or group of municipalities, when required to establish a pasteurization depot, shall have an opportunity to make such representations on the subject as it thinks proper. According to the other clause a municipality shall not be obliged to comply with the requirement of the Minister in regard to the establishment of a pasteurization depot if it nominates a person (approved by the Minister) who is willing to undertake the establishment of such a depot. A clause is added providing for the cancellation of a pasteurization licence issued to such a person if he fails to establish the depot within a specified time. On July 19, 1945, the Minister addressed representatives of the metropolitan municipalities and explained to them the whole plan for compulsory milk pasteurization. He covered every aspect of the subject and asked for cooperation. He pointed out that there might be certain aspects of which some persons engaged in the trade might not approve, but he declared that if action was to be delayed until absolute unanimity was achieved, no plan would ever be forthcoming. The municipalities were given until September 15, 1945, to make their "representations". We are given to understand that objections of various kinds have been made and that delay will be continued. To allow delay is a short-sighted policy. More than twelve months have elapsed since the Milk Pasteurization Committee made its report. The longer delay is allowed to continue, the more difficult will it be to cast it aside. It has been said that procastination is the art of keeping up with yesterday. Yesterday was the day of such outbreaks of enteric fever as occurred not so long ago at Moorabbin caused by a defective milk supply. Victoria has the opportunity of giving a lead to the whole Commonwealth in the purification of its milk supply. If the Victorian Government brooks any further delay in the implementation of the *Milk Pasteurization Act*, 1943, it will earn for itself the distinction of "keeping up with yesterday", and in so doing of continuing to expose the population to an easily removable danger.

# Current Comment.

## SO-CALLED PSYCHOGENIC RHEUMATISM.

IN recent years there has crept into medical literature a term, psychogenic rheumatism, which is unfortunate and whose use is to be deprecated. Thus, E. W. Boland and W. P. Corr, both officers in the Medical Corps of the United States Army, have discussed 450 cases to which they give the label psychogenic rheumatism.[1] They apply the term to those "states in which symptoms such as pain, stiffness, subjective sense of swelling or limitation of motion in the muscles or joints are caused, intensified or perpetuated by mental influences". Here there are two grounds for objection. The first is that the category of rheumatism is made very wide; it is in fact used almost as the laity often use it—in a way in which the term influenza is sometimes used. The other is that the word psychogenic is given a meaning beyond that of having its origin in the mind. In regard to the question whether rheumatism proper can be really psychogenic, the answer in the present state of knowledge must be one of incredulity. The question was discussed briefly by P. Ellman and S. D. Mitchell in 1936 in the second of the "Reports on Chronic Rheumatic Diseases", issued by the British Committee on Chronic Rheumatic Diseases. They stated in answer to the question, "Does mental disturbance lead directly to organic disease in the arthritic?", that in the present state of knowledge judgement should be suspended. It seemed likely to them that in the arthritic subject both mental disturbance and organic disease were evidence of a general biological inadequacy. One of the most important contributions to this subject came from the pen of James L. Halliday, who described his article as a preliminary study and entitled it "Psychological Factors in Rheumatism".[2] He pointed out that the chief emphasis in the clinical teaching of students has been the identification of disease. The question all students try to answer is: "What disease has the patient got?" Halliday found that one of the diseases which the patient might get was rheumatism, and this he described as a label—"convenient, comprehensive and scientifically vague". Another question which Halliday was taught to answer was: "What has the patient met?" This was not always put in that way, but the question was framed thus: "What are the ætiological factors?" Inquiries into ætiology were in his experience confined to the physical factors which the patient had encountered—trauma, heat, cold, wet, dietary, poisons and invasion by microorganisms. No investigation was made into psychological factors. This state of affairs has changed a good deal, for as Halliday remarks, to know what a patient has met is often of more practical value than to know what he has got. He states three questions which should be included in inquiries into ætiology. The first is, "What kind of a person is this?"—that is to say, with what constitution diathesis or pattern did he enter the world, and how has it been modified by his physical and psychological environment? The second question is: "Why of all the days and weeks of his life did he begin to take ill when he did?" This, Halliday points out, is an inquiry into the environmental factors he encountered about that time which were of a potency and nature likely to cause him to react by illness. The third question is: "Why did he take ill in the manner he did?" In this regard Halliday asks why, after a bereavement, does one person remain well, another develop asthma, another disordered action of the heart, another gastritis, another hyperthyreoidism and another rheumatism? Admittedly in the present state of knowledge full answers cannot be given to these questions, but, as Halliday observes, if inquiries are made on these lines, much light can be thrown on the illnesses of individuals and also of communities.

This brings us to the latest contribution to this subject, a paper by J. Flind and H. Stuart Barber,[3] bearing the eminently correct title: "The Psychogenic Basis of Some So-Called Rheumatic Pains." The studies on which their paper is based were made at a special Rheumatic Treatment Centre, established in 1940 for Royal Air Force personnel. This centre was close to a Royal Air Force hospital for the treatment of neuroses, and this meant that rheumatic patients could be studied from both the medical and the psychiatric aspects. "For reasons of service policy" the centre was closed after it had been in existence for twelve months. During the twelve months of its existence 120 patients were admitted to the centre; they included patients with acute rheumatic fever, rheumatoid arthritis, osteoarthritis, *erythema nodosum*, and a group whose chief symptom was one of generalized bodily pain. The last-mentioned group included 42 whose condition at the time of the investigation was in no way a physical one, but was entirely a psychogenic reaction. In these 42 cases the diagnoses included fibrositis, subacute rheumatism, myositis and multiple joint pains. In the clinical histories of these patients certain features were found to recur so frequently that their significance appeared to be beyond doubt. These included symptoms suggestive of neurosis, morbid fears about health, a family history of neurosis, irregular employment and neurotic traits in early life. Special reference is made to the importance attached by Kretschmer in his study of hysteria, based on his experience of military psychiatry in the first world war, to the estimation in each case of the will to be well (*Gesundheitswille*)—the attitude of the patient to illness, his readiness or otherwise to succumb to minor ailments and discomforts. In 23 of the 42 cases one or other parent had been of the worrying, over-anxious type to an extreme degree; in only one case had a parent been the subject of a psychosis. On physical examination the signs of active rheumatic infection were conspicuous by their absence, and despite multitudinous aches and pains the patients appeared to be in reasonably good health. Whether the pain was in the joints or confined to the muscles, the full range of movement could always be obtained. Active muscular resistance to some movements was encountered, but with persuasion and exhortation to relax the complete range was invariably possible. Hysterical reactions were present in seventeen persons, all of whom belonged to the ground staff. These reactions were divisible into the following three types: (*a*) reappearance in hysterical form of what might have been a former organic rheumatic condition, (*b*) hysterical prolongation of what was possibly a former rheumatic condition, (*c*) hysterical complications of an underlying mental disorder. Flind and Barber point out that diagnosis is difficult: In the first place the complaint of pain can be neither proved nor disproved; a second difficulty arises when a doubtful physical sign is elicited. If an initial diagnosis is incorrect, they think that little exception can be taken in many cases; they thought, however, that in their series a psychogenic reaction had not been considered often enough as time went on and the response to treatment was disappointing.

In their final discussion on this subject Flind and Barber mention a number of authors who have sought to discover whether anomalies of personality and emotional states play a significant part in the ætiology of undoubted organic conditions such as chronic arthritis. Details of these need not be given, for no other conclusion can be reached than that of Ellman and Mitchell, which has already been stated. In regard to the relationship of mental processes to organic disease it would be foolish to declare out of hand that the former never operate in the causation of the latter—a great deal yet remains to be learned about the central nervous system and its activities. On the practical side a final reference may be made to another paper by J. L. Halliday[1] in which his main theme is: "How do we differentiate between 'true fibrositis' and 'psychoneurotic rheumatism'?" His answer is, "by working more and talking less". In other words, "the differentiation depends on the nature of the observations we make rather than on the views we hold".

[1] *The Journal of the American Medical Association*, Volume CXXIII, 1943, page 805.
[2] *British Medical Journal*, Volume I, 1937, pages 213 and 264.
[3] *The Quarterly Journal of Medicine*, April, 1945.

[1] *Annals of Internal Medicine*, Volume XV, 1941, page 666.

# Abstracts from Medical Literature.

## OPHTHALMOLOGY.

### Control of Intraocular Infection.

B. W. RYCROFT (*The British Journal of Ophthalmology*, February, 1945) lists the means taken to control intraocular infections in battle casualties in the Italian campaign. Penicillin powder was insufflated at an early stage into all wounds of the eye and the sterilization of the conjunctiva by penicillin may be considered an established fact. In many cases a spreading keratitis failed to respond to any treatment except a Saemisch section. This drastic procedure saved the cornea from becoming permanently opaque, apparently by relieving tension in the corneal tissues. Infections in the anterior chamber responded to protein shock and sulphonamides in nearly every case. They did not respond to penicillin by the muscular route, but did respond if the aqueous was withdrawn by a hypodermic needle and replaced by penicillin. When the vitreous was infected, penicillin was injected into that media, but did not influence the course of the infection. From certain clinical experiments it appears, but is not considered proven, that penicillin does not enter the ocular media when given by intramuscular injection.

### Penetrating Wounds of the Eye.

H. H. SKEOCH (*The British Journal of Ophthalmology*, March, 1945) dealt with 60 penetrating wounds of the eye during the Italian campaign. Of these 300 were cases of intraocular foreign body, half being visible on X-ray examination. Only fifty foreign bodies were extracted, or just over 16%. Non-magnetic iron has been used to a large extent in high explosives; it is difficult to extract and causes just the same siderosis as ordinary iron. Aluminium is radiotranslucent and was extensively used in hand grenades. "Splashes" of lead and nickel were common. After a clean up, calcium penicillin and sulphathiazole powder was used as a routine measure on the wound and X-ray localization was attempted. The author uses a ring of stainless steel wire 25 millimetres in diameter with a small bead of solder. The ring is slipped into the upper and lower fornices. It then "sits" on the equator of the eye and the solder bead is placed over the caruncle. Three X-ray pictures are then taken, lateral, oblique and antero-posterior, and the position of the foreign body relative to the ring is noted. Foreign bodies deep in the orbit were usually reached by an incision through the base of either lid, care being taken to avoid the inferior oblique and *levator superioris*, and exploration being done outside the cone of muscles. For intraocular foreign bodies a large hand magnet was constructed, the size of a fifty cigarette tin, with a pull of four pounds, and was found more useful than the giant magnet. Removal by the posterior route was most often employed. If the foreign body was judged to be free in the vitreous an incision in the sclera was made anterior to the *ora serrata*, that is, from seven to eight millimetres posterior to the limbus, and extended radically forward through the base of the ciliary body for three millimetres. Contrary to expectations, this did not cause intraocular hæmorrhage. When the retina was incised by a posterior stab for bodies localized further back, patients were followed up for eight weeks without any sign of detachment being seen.

### Corneal Transplants.

MARTIN I. GREEN (*Archives of Ophthalmology*, February, 1945) describes a simplified technique for corneal transplants. The basic instrument is a clockwork trephine fitted with two blades, one 4·1 millimetres in diameter for the patient, the other 4·0 millimetres for the graft. Both blades are designed with a one millimetre shoulder to prevent penetration beyond the cornea and injury to the lens. The 4·1 millimetre trephine is laid on the patient's cornea and given a turn or so by hand. Fluorescein shows up the circle and the stitches are then inserted in the form of a cross. An atraumatic needle and very fine silk are used. The stitches are then drawn aside. With the 4·0 millimetre trephine a graft is now cut from the donor's cornea, some pressure being exerted and the blade being spun rapidly by the mechanism in order to secure a clean cut. The blade with the graft in its lumen is then detached and the 4·1 millimetre blade is screwed on. The trephine is now applied to the cornea of the patient's eye in the area previously outlined with fluorescein. By firm pressure and rapid spinning a clean disk is removed. Frequently at this stage the patient remarks how clearly he can see. If the iris prolapses a little gentle manipulation will replace it. A drop of 1% atropine sulphate solution is placed in the anterior chamber. The 4·0 millimetre blade with the graft is placed just over the hole and a few drops of saline solution cause it to fall into its bed. As the graft always expands, it fits snugly in a few minutes. The suture is tightened and tied and the lid is held down by a lid suture. The eye is opened in a week.

### Hæmorrhage after Cataract Extraction.

E. E. NEEF (*Archives of Ophthalmology*, March, 1945) has made a study of the causes of post-operative hæmorrhage in cataract extraction. Instead of utilizing statistics he attempted to evaluate individual cases and if possible to predict its occurrence. To this end in every case blood and platelet counts were made; bleeding and coagulation times were determined; clot retraction and tourniquet tests were made; hæmoglobin, blood sugar and urea estimations were carried out, as well as complete physical examination and recording of the family history. All was in vain. In those cases in which hæmorrhage might reasonably have been expected to occur after operation, no bleeding took place, but hæmorrhage occurred in a number of others. Two factors, and two alone, appear to produce hæmorrhage into the anterior chamber, trauma at operation and trauma afterwards. The simplest operation, extracapsular extraction after preliminary iridectomy, produced no bleeding at all, whereas intracapsular extractions with full iridectomy at the time caused hæmorrhage in 18% of cases. Between these extremes the percentages were found by the author to vary with the trauma. No cataracts were extracted through a round pupil, so that no figures for this are available in the present paper. The hyphæmia usually occurred between the third and sixth days. There was good evidence that excessive tone in the orbicularis muscle had something to do with this by squeezing the eye and rupturing the healing incision. Also rapid filling of the anterior chamber with bursting of the wound was a factor. But these only did the damage if the eye had been injured at operation. The second major cause, trauma after operation, generally occurred when the patient accidentally bumped his eye, sneezed or started violently. An occasional case may have been due to faulty nursing.

### Retinal Changes in Diabetes.

A. J. BALLANTYNE, of Glasgow (*Archives of Ophthalmology*, February, 1945), contrasts the retinopathies of diabetes and hypertensive diseases. In both conditions the earliest recognizable lesions are pathological changes in the retinal vessels. In diabetes the lesions affect the venous, in hypertension the arterial side of the circulation. In diabetes venous stasis, microaneurysms of the capillaries and later gross variations in venous calibre occur. Histologically the early changes consist of the appearance of fatty granules in the endothelium. In hypertension these occur in the media and adventitia. The most striking changes in diabetes are the formation of venous loops, coils and networks with phlebosclerosis and "new vessel" formation. Hæmorrhages in diabetes occur primarily in the central area of the fundus deep in the retina and are characteristically rounded, in contrast with the flame-shaped hæmorrhages of hypertension which occur in the nerve fibre layer. The author concludes that in both forms of retinopathy toxic factors are responsible for the initial changes in the vessels, that these factors are specific to diabetes and hypertension, and that their selective action on the vessels accounts for the differentiation of the two forms.

### Electrical Cataract.

A. L. ADAM AND M. KLEIN (*The British Journal of Ophthalmology*, April, 1945) report a case in which a man working at a power station received a discharge of 11,000 volts by sparking contact with the rim of his spectacles. The eyes did not appear to be damaged at the time, but within six months vacuoles and opacities had developed in the anterior capsules of both lenses. These remained stationary for the next sixteen months. There were no other changes in the eyes. A survey of fifty such cases reveals the above to be the typical condition in electrical cataracts. The pressure in reported cases varied from 200 to 40,000 volts. Both direct and alternating currents were in evidence, and in most cases severe burns from flash contact occurred. Some cataracts developed within a few days, others after several months. In nearly every case vacuoles and opacities appeared in and under the anterior capsule. The lens nucleus was not affected. In a few cases the cataract cleared up; in most it remained stationary for a time and went on to maturity later. Comberg (1936) produced these cataracts experimentally in rabbits. Evidence hitherto collected in

not sufficient to enable a statement to be made of the cause of electrical cataract or rather the process by which it develops.

### Cataract Plus Glaucoma.

CASES in which both cataract and glaucoma exist in the same eye present a knotty problem for the ophthalmic surgeon. The question arises whether removal of the lens alone, with the deepening of the anterior chamber which follows this procedure, will cure the glaucoma also. J. S. Guyton (*Archives of Ophthalmology*, April, 1945) lists 44 such cases, five being of the acute congestive type, the others chronic. In two of the acute cases a combined extraction was performed, in two an iridectomy with later cataract extraction was carried out, and in one a fistula with extraction was used. In all of these cases the result was satisfactory. In 21 cases of primary non-congestive glaucoma, uncontrolled by myotics, an initial fistulizing operation prior to cataract extraction gave uniformly good results, while an initial cataract extraction in no case controlled the tension, and later operative procedures for the glaucoma were successful only in three instances. There were ten cases of chronic glaucoma in which acute exacerbations had occurred. In four of these a combined extraction was done with the loss of one eye later from uncontrolled tension. In six others a fistula operation was performed first and extraction of the cataract later. Despite this, the tension rose in four and cyclodialysis had to be done to control it. In eight cases tension could be controlled by myotics, and in all of these extraction was performed first; in half of these the treatment was successful. The conclusion is that in a few cases of mild glaucoma, easily controlled by myotics, a cataract extraction may be the only operation necessary. In the large majority, however, it is better to lower the tension first and operate on the cataract at leisure later.

## OTO-RHINO-LARYNGOLOGY.

### The Ascertainment of Deafness in Infancy and Early Childhood.

I. R. EWING AND A. W. G. EWING (*The Journal of Laryngology and Otology*, September, 1944) state that in order to preserve normal voice habits, which can be achieved by proper training under skilled supervision, it is desirable even during the first year of life to be able to ascertain the existence of deafness. If interest in the voice and speech is not cultivated in the earliest years, then, when the child begins to walk freely, interest is directed to the exploration of the world of things, while interest in persons, which is essential to the development of speech or lip-reading, is often found to be lacking. Study was made of 91 apparently normal children ranging from the first year to the fifth year, the children being divided into age groups, with the object of determining the reactions to various auditory stimuli which should be expected in normal children. Similar stimuli were then employed for determination of hearing capacity in 170 children suspected of deafness. During the first, second and third months, percussion sounds yielded a quicker response than voice, and as a rule the manner of a baby's response was reflex, taking the form of blinking, involuntary jumping, turning in sleep or twitching the fingers. After the third month voice steadily gained over percussion sounds as a form of stimulation in winning a quick response and the voice soon tended to encourage a learned response, indicating the association of meaning, such as feeding, washing *et cetera*, with the sound of the voice. During the second six months capacity to locate the source correctly is rapidly improved and is usually highly developed by the first year. Also, after six months there is increasing capacity to distinguish sounds of different physical patterns. Pure tone stimuli were tried, but proved much less effective than complex sounds such as a drum, a loud bell, light tapping on a table, a wooden cylinder rolling on the floor, the click of a door handle, or the voice of mother, nurse or matron. During the second year there is developed the capacity to comprehend a few words and simple phrases, although there is considerable variation in individual capacity to understand words. Simple speech tests of hearing, such as quietly talking to the child about something in which an interest has been shown, are suitable for most of the children over one and a half years of age. Children at this age do not pay attention to whispered speech. Most of these children, if not deaf, turned or looked up or appeared more alert if called by name, and it was possible thus to prove the capacity to hear a very soft voice at measured distances. Similar testing can be carried out by meaningful sounds such as bells and pitchpipes. The use of pitchpipes to explore the range of frequency over which children could hear was still impracticable up to the end of the second year. Throughout the third year, speech and voice tests proved to be a satisfactory means of testing hearing, although a variety of meaningful stimuli were necessary to meet the interests of children in this age group. Pitchpipes now proved to be a suitable means of testing a child's response to a range of frequencies. After the fourth year quiet speech and the whispered voice are suitable means of testing hearing. Pure tone audiometric tests are unsuitable for these children because they cannot maintain interest in such tones for long, and thus reliable threshold readings cannot be obtained before the child's interest flags. Stimuli similar to those found suitable for normal infants were employed to test those suspected to be deaf. Responses elicited continued to be of reflex nature for a longer period in partially and severely deaf children, for the reason that these babies heard fewer sounds and had fewer opportunities of connecting with their meaning such sounds as they could hear. None of the deaf babies under one year of age located the sounds they heard. During the second year, if deafness is severe, there is less tendency to vocalize than in normal children of the same age, and even if these children continue to vocalize freely, their efforts do not include many, if any, learned patterns. The grounds for diagnosis of deafness in children are based upon observation of all aspects of a child's behaviour as well as upon reactions to specific forms of stimuli, such as the voice, comprehension of speech, percussion sounds and pitchpipes. The cooperation of deaf children often had to be won with toys and games, tests and observations being carried out while the child was thus cooperating in play. In children up to two years of age it was possible thus to ascertain gross defects of hearing, but only approximate information about the range of frequency and intensity could be determined. In children over two years of age backwardness of talking always suggested deafness. The response, if any, when a child is addressed, is used for the first test, then the child is introduced to purposive games with coloured blocks, pegs and sockets and the response to verbal instruction is observed. When these tests suggested gross deafness, drums, bells and pitchpipes were found necessary for further testing. Often the tests had to be repeated until the child's confidence could be secured. In severe deafness reflex responses might occasionally be observed after unexpected sounds. In children of four and five years some further steps to estimate the hearing capacity may be made with commands applicable to the games being played, the words being spoken in loud, soft or very soft voices. The whispered voice at measured distances also may be used. Also tests of acuity with chosen vowels and consonants are now practicable. Even in the older children, both normal and deafened, it was found that with rare exceptions interest could not be held sufficiently long for the estimation of pure tone thresholds by audiometer.

### Penicillin in Mastoiditis and its Complications.

F. J. PUTNEY (*Archives of Otolaryngology*, April, 1945) records his experience with penicillin therapy in ten cases of complicated mastoiditis. In six cases thrombosis of the lateral sinus occurred, while petrositis, meningitis, extradural and cerebellar abscess complicated the remaining four. The infecting organisms were shown to be penicillin-sensitive, and in eight of the cases prior treatment with sulphonamides had failed to check the disease or to prevent the onset of complications. At first the intravenous route was employed, but intramuscular injections were found to be effective; 25,000 units were given every three hours, and later the dose was reduced to 15,000 units. One patient had penicillin treatment for one week, and although fever and aching were controlled, otorrhœa and mastoid tenderness persisted and then symptoms of lateral sinus thrombosis developed. Mastoid operation with drainage of the lateral sinus was performed and penicillin treatment both locally and intramuscularly was then resumed. Healing was rapid and uneventful. In another case in which similar treatment with penicillin was used for three weeks there was cessation of toxic and subjective symptoms, yet the ear discharge persisted and X-ray examination revealed cloudy mastoid cells. At operation the mastoid cells were filled with necrotic tissue. Recovery was uneventful. These two cases are stressed to indicate the need for adequate surgical intervention in combination with penicillin treatment. When more serious complications occur, such as were diagnosed in the remaining cases, then routine surgical procedures, to provide adequate drainage, are essential.

# British Medical Association News.

## VICTORIAN BRANCH NEWS.

THE following is the result of the ballot for the election of the members of the Council of the Victorian Branch of the British Medical Association and of the Committee of the Medical Society of Victoria for the year 1946, together with the votes polled.

| | |
|---|---|
| Dr. Robert Southby | 443 |
| Air Vice-Marshal T. E. V. Hurley | 441 |
| Dr. John S. Green | 440 |
| Dr. H. C. Colville | 437 |
| Dr. John Dale | 436 |
| Lieutenant-Colonel A. E. Coates | 435 |
| Brigadier F. Kingsley Norris | 432 |
| Professor P. MacCallum | 428 |
| Dr. L. W. Johnston | 397 |
| Dr. A. Brown | 381 |
| Dr. J. H. Gowland | 380 |
| Colonel Douglas Thomas | 366 |
| Dr. C. Byrne | 362 |
| Dr. Kenneth Smith | 360 |
| Dr. E. M. Ettelson | 299 |
| Colonel T. G. Swinburne | 263 |

The votes polled numbered 450, three being informal.

# Medical Societies.

## THE MEDICAL SCIENCES CLUB OF SOUTH AUSTRALIA.

A MEETING of the Medical Sciences Club of South Australia was held on July 6, 1945, at the Institute of Medical and Veterinary Science, Adelaide.

### Aviation Medicine.

PROFESSOR E. H. LE MESSURIER read a paper on aviation medicine. He said that in recent years the term "aviation medicine" had come to cover a large number of subjects from various branches of the basic sciences which were directed towards the improvement of the comfort, efficiency and safety of aviation personnel. Subdivisions could be broadly made into (*a*) problems related to flying personnel, (*b*) problems related to grounded personnel, and (*c*) the application of general and industrial medicine to living and working conditions. The last-mentioned could be rapidly dismissed for the purposes of the meeting, although in the days of peace ahead it would become of extreme importance. Professor Le Messurier went on to say that during the war the most intensive work had been devoted to the problems of flying personnel, unfortunately to the exclusion of ground staff problems. In the last two years, however, more attention had been directed to the improvement of the ground staff's conditions. The failure to realize the importance of trained scientific observers in the field undoubtedly contributed to this neglect. In Britain and the United States of America this need was realized, and sections of operational research were established for the collection of data and the correlation of information from various sources. Many of the sections required information of medical, psychiatric or physiological nature, and it was essential that team work be brought to bear on the problems.

Referring to the first subdivision, Professor Le Messurier said that it was in this connexion that the most spectacular and interesting work had been seen. The problems were acute and needed a quick answer. The first problem was the selection of the right type of men, not only as pilots, but for the other positions in air crews in which distinctive attributes and temperaments were needed. Unfortunately, in the beginning more energy was devoted to the selection of the pilot than to that of the others, who were taken from the other musterings more or less on the basis of supply and demand. Many ideas had been put forward as a guide to the choice of ideal aircrews, but many surprises were experienced. Many a "duffer" had proved excellent in action, and others had been shot down before learning all the tricks of the trade. Although an enormous amount of work had been done throughout the Allied forces, it was probably safe to say that no great advance had occurred in selection in any of them, with the exception of the United States Navy. In that service had been developed an extremely well-tested *questionnaire* directed towards discovering the temperamental and psychological make-up of the recruit.

Discussing the use of oxygen, Professor Le Messurier said that in the early part of the war it had been noticed that all German aircraft that had crashed contained the slogan "oxygen wins battles". Although towards the end of the first World War the Allies introduced the use by flying personnel of oxygen by fairly crude methods, the point had not been properly appreciated that at heights above 10,000 feet oxygen became a necessity. There was, unfortunately, among the British groups, a tendency to pooh-pooh the idea, and it took a severe struggle by the medical and scientific groups to persuade the younger generation that to try to be "tough" and do without oxygen was only to be foolish. After a great deal of experimental work, suitable equipment was evolved to give the oxygen flows necessary for various altitudes, and what proved of greater importance, greater flows for some aircraft stations. It was soon found that the air-gunner was in need of a much greater flow than the pilot or any other sedentary member of the air crew. The inaccuracies in many navigators' logs were suspected of being, and proved to be, due to inadequate oxygen supplies. Some surprises were met with in defining the supposedly sedentary type of job. Figures calculated for sedentary jobs at ground level were found to be considerably astray for the same jobs at altitude. Seemingly trivial movements of the aircraft in flight were found to use considerable amounts of muscular energy in their correction.

Professor Le Messurier then showed a cinematograph film, which demonstrated the loss of efficiency and the danger attendant upon anoxia. He said that the film showed how important it was to educate or indoctrinate men, and it also gave some idea of the expense, time and trouble taken in the training of each air-crew member in the technique of using oxygen equipment and in the dangers to be faced. With an increase in altitude to 32,000 feet with full oxygen supply, the limit of replacement was reached, and although it was possible to fly to over 40,000 feet for short periods, it was dangerous, as the oxygen tension was falling rapidly. In an endeavour to correct this, new oxygen equipment was developed. This was known as pressure breathing equipment; it allowed positive pressure to be developed at inspiration, so that the lungs were inflated. Several ingenious contrivances were made; in one, positive pressure remained on throughout and muscular effort was needed for expiration; in another, on expiration the pressure was cut off and expiration was again passive. To aid the chest wall, a pressurized waistcoat inflated by the same flow prevented over-extension of the chest. The upper limit was found to be approximately 50 centimetres of water, but a safe limit was probably only 20 centimetres. With the addition of this equipment, ascent to heights from 43,000 to 46,000 feet was possible.

Professor Le Messurier went on to say that it was easy to see how the waistcoat could be expanded into an overall pressure covering, and a pressure suit developed. Several experimentally successful suits had been evolved, and in one of them Squadron Leader Swain had reached a height of over 50,000 feet; but for many reasons the suit was not so serviceable as a pressure cabin. The danger of perforation of a sealed cabin, especially by large shells, was a real problem, and experimental evidence as to the possible physiological effects was needed. The Wright Field and Farnborough groups had tackled this particular aspect. It was found that 2·75 pounds' differential could be taken without ill-effects when the time of decompression was about fifteen-thousandths of a second. This would be equivalent to an eight to ten foot hole in a large cabin or a one foot hole in a single-seater aeroplane. Pressure differences of as much as 6·55 pounds had been tried on several occasions, but the effects were most uncomfortable. The symptoms were like a severe punch on the chest with a padded glove.

Professor Le Messurier then referred to bends. He said that with the evolution of aircraft of the "Flying Fortress" type—which flew high and had a long range—the problem of bends captured attention. One could easily see that members of air crews who were predisposed to this condition could unwittingly jeopardize the lives of their companions by forcing the aircraft down to lower levels than those assigned to the group and calculated to keep them above "flak" or enemy interception. Although the complete physiological basis of bends had not been explained, sufficient experimental evidence had accumulated to suggest that the formation of nitrogen bubbles in tissues whose blood supply was not great was at least the major factor. The accumulation of nitrogen released by the lowering of outside pressure was similar to the bubbles formed in the soda-water bottle

when the cork was removed, and led to pain, either in joints, like the knee, or in the chest, and of such intensity as to make the sufferer incapable of carrying out his duties. The cure was recompression—a descent to a lower altitude. The critical height for bends was 30,000 feet and above, and cure could usually be accomplished by a drop of 3,000 or 4,000 feet. It was found that pre-oxygenation of the pilot for periods up to an hour at ground level could to a large extent prevent these crippling pains. As far as could be told, the therapeutic value of oxygenation was largely based on the displacement of nitrogen and the replacement of oxygen throughout the body, particularly in fatty tissues, where nitrogen was most soluble.

Discussing cold, Professor Le Messurier said that in the European theatre of war, and even in the north of Australia at high altitudes, the question of suitable clothing as protection against cold occupied a large amount of research energy. The physiology of temperature control had received a considerable "boost", and after many attempts to increase the insulating properties of clothing without loss of fine movement and without too great bulk, heated flying clothing was evolved. Cockpit and cabin heating systems received attention, and by a slow process these improvements were passed to the manufacturer, and succeeding models were gradually improved. Self-preservation was another problem of first-class importance. In Europe the problem was different from that of North Africa and the South-West Pacific Area. Britain early realized the value of air-sea rescue units. Various types of safety equipment were developed. Ditching suits were a coverall, to be donned in the few minutes allowed before an aircraft came down on the water; the apparatus consisted of a waterproof suit containing air, occluded by strings tied at the neck and wrists. The suit was evolved in answer to the realization that in every ocean in the world the water temperature was below body temperature. In arctic regions the time of survival was only five minutes. "Flak" suits were developed by the Americans; they consisted of armour-plating for the chest and back and a helmet, and prevented many injuries.

Professor Le Messurier then said that the problem of centrifugal forces as a result of high-speed turns had occupied Allied research workers from the early part of the war. It was thought that any pilot who could pull on greater G than his opponent and still retain vision and consciousness would have the advantage. The symptoms of increasing G were those of diminishing peripheral vision, which, when the diminution was almost complete, was known as "grey-out"; this was followed by blackout and finally by unconsciousness, and in some cases by convulsions. In many cases, in which for no obvious reason pilots suddenly found themselves at low altitude diving vertically towards the ground, the condition was probably the result of turning too quickly or pulling out too quickly from a dive; the pilot suffered the effects of G, with subsequent loss of control of the aircraft. An experiment with a snake served to illustrate something of the problem. If a snake was held vertically, tail downwards, it became unconscious, owing to the fact that it had no valves in its venous system. If, on the other hand, it could be dipped in a cylinder of water, then the hydrostatic pressure was sufficient to keep the venous return normal. Working on this principle, Franks in Canada, Cotton in Australia and Army Air Forces at Wright Field, had evolved protective equipment filled with either a fluid, like water, or air delivered from a high-pressure bottle; this generally assisted the external compression, promoting venous return to the heart, and so allowed better pressure to arrive at the head and keep vision clear. This equipment had been perfected, but up to the time of the meeting tactics had not warranted its use on any large scale. It was thought that "hit and run" was a better method than to try to "mix it" with the enemy, and the equipment had consequently been laid on the shelf until it should be wanted. Work had been continuing along lines calculated to give the maximum of efficiency with a minimum of encumbrance. Professor Le Messurier then showed a cinematograph film depicting the equipment developed to produce G for scientific research, and showing the effect of G on flying personnel.

## Correspondence.

### THE MODERN TREATMENT OF PULMONARY TUBERCULOSIS IN AUSTRALIA.

SIR: I should like to make some comments on your editorial, "The Modern Treatment of Pulmonary Tuberculosis in Australia" (THE MEDICAL JOURNAL OF AUSTRALIA, September 8, 1945). In reference to the extent to which such treatment has been used here, I stated in a paper in the same number that "we in Australia have lagged far behind" many countries overseas "in the application of special collapse methods". Your article rightly points out that the inadequate number of available beds has reduced the amount of special treatment which could be given. My statement, however, referred to the use made of the accommodation at our disposal. This statement was based largely on a study of the annual reports of the Victorian Department of Health from 1930 to 1942. I believe the situation in State institutions elsewhere in Australia during that period was not greatly different. Some standard of comparison between Australia and countries overseas is possible by the consideration of the number of interventions in relation to the number of admissions. For example, during the five years from July 1, 1937, to June 30, 1942, 45 patients of 4,843 admissions to Victorian State Sanatoria were treated with thoracoplasty. This is approximately 1%, about the same rate as for the previous five years. Even if half the gross admissions were readmissions, the percentage would still be low in comparison to countries overseas with similar living standards. For example, according to Drolet (*American Review of Tuberculosis*, Volume XLVII, 1943, page 184), during the five years 1937 to 1942, 4% of all patients in 99 Canadian and American sanatoria were submitted to thoracoplasty. A comparison of the situation regarding artificial pneumothorax and phrenic nerve paralysis showed a similar state of affairs. Prior to 1942 thoracoscopy and simultaneous bilateral collapse were hardly ever used in Victorian State institutions.

Your article states "whether these surgical measures could, with advantage, be used oftener . . . is difficult to determine". It also describes the data available on which a reliable opinion can be formed as "not so helpful as they might be". After nearly twenty years' observation of treatment in Europe, Britain and North America, these statements appear to me somewhat surprising. The most important single factor in prognosis is whether or not tubercle bacilli are present in the sputum on discharge. There are adequate data available from many different countries to show the great influence of collapse therapy in the abolition of infective sputum and in the prolongation of life. The experience of the Bilthoven Sanatorium in Holland, quoted by the British authorities, Kayne, Pagel and O'Shaughnessy ("Pulmonary Tuberculosis", 1939), is typical of many overseas institutions. The proportion of positive sputum patients discharged as "negative" rose from 25% in 1931 to 40% in 1925, to 60% in 1930 and to over 70% in 1936. This marked improvement is attributed to the increasing use of collapse therapy. Kayne, Pagel and O'Shaughnessy also state that "by applying all modern methods of treatment, from 70% to 80% of patients can now be discharged tubercle-negative". In fact, the application of a full programme of effective collapse therapy results in a marked improvement in outlook for the individual patient. It also lessens the incidence of infection in the community. Such intervention is essential in many cases to produce the mechanical conditions which alone will allow the forces of resistance, native and acquired, to operate effectively. Those, like myself, who advocate the greater employment of collapse therapy in Australia, do so, not because we are "enthusiasts", but because we are realists!

Some local critics of these special methods have used Drolet's investigations (see above) in support of their criticism. Drolet showed that the institutional death rate over the period reviewed was stationary, in spite of the use of collapse therapy in approximately half the adult patients. This, however, cannot be accepted as valid evidence against the value of this treatment, for the following reasons:

1. This death rate includes: (*a*) children, in the very great majority of whom collapse therapy is contraindicated; (*b*) patients too advanced to be suitable for special treatment; (*c*) those in whom such treatment was unsuccessful owing to the nature of the disease or wrongful application of collapse methods.

2. The decades 1920 to 1930 and 1930 to 1940 were largely a period of experimentation. In 1931 only about 10% of patients in American sanatoria had collapse therapy (J. Alexander: "The Collapse Therapy of Pulmonary Tuberculosis", 1937). Alexander also pointed out that: "Unfortunately many physicians and surgeons have begun to use collapse therapy without the necessary prolonged period of apprenticeship, with the result that the indications for operation have often been wrongly interpreted, inefficient operations have been performed, and many complications have occurred. The results under such circumstances have naturally been highly unsatisfactory." (*a*) It was the rule rather than the exception to maintain ineffective pneumothoraces with frequently disastrous results from empyema and spread. Such cases

would maintain a high institutional death rate. Sanatorium statistics in fact show a higher mortality for patients with unsatisfactory pneumothorax than for those without pneumothorax. (b) Technical improvements in thoracoscopy were introduced only in the years immediately before and after 1930. In Drolet's survey only 12·3% of the pneumothorax cases between 1937 and 1941 were submitted to thoracoscopy, compared with 40% to 60% in some Continental and a few English sanatoria. (c) Other special treatments such as plombage, extrapleural pneumothorax *et cetera* were undergoing trial with resultant unfavourable effects on the institutional death rate.

3. Another factor in the maintenance of a stationary institutional death rate was the high, unchanged percentage of advanced cases admitted. From 1931 to 1941 this remained at about 84%, of whom 53% to 58% were far advanced (Drolet and N.T.A. figures). Few far advanced cases are suitable for collapse therapy and complications are much more common in this group.

4. It has been found in Canada and the United States of America that with a wide application of present case-finding methods, notably mass radiography, there is a marked reduction in the percentage of far advanced cases coming under treatment, and an increase in the number of patients favourable for collapse. A survey of institutional death rates in the 1930's is therefore unlikely to be a reliable guide as to the value of collapse therapy at present or in the future.

Yours, etc.,

HILARY ROCHE.

Austin Hospital,
Heidelberg, Victoria, N.22,
September 17, 1945.

## A DISCLAIMER.

SIR: My attention has been drawn to the June, 1945, number of a publication entitled, apparently, *Labour Digest*, in which there appears an article, "Human Health and Industrial Problems", purporting to have been written by me. I did not write the article in the form in which it appears in *Labour Digest*; I did not authorize its publication; and the use of my name in connexion with this article was quite unknown to me until a few days ago, and might have remained unknown indefinitely had not one of my friends picked up this digest by chance. The article appears to be a series of quotations, printed out of context, and with substantial omissions from the original text, from a public address which I gave at a meeting of the Institute of Industrial Management in Adelaide about a year ago. No acknowledgement of this source is made in *Labour Digest*; neither is there any indication that a considerable portion of the original address is omitted.

I do not care in the least what the ordinary reader of this digest thinks about my opinions. I am, however, somewhat concerned about my reputation in the eyes of any of my professional colleagues who might chance upon the article in question. In the circumstances, would you be so good as to publish this disclaimer?

Yours, etc.,

H. M. L. MURRAY.

Department of Labour and National Service,
Century Building,
129, Swanston Street,
Melbourne, C.1.
October 12, 1945.

## CAN EPILEPSY BE CURED?

SIR: Like jesting Pilate many years before, Dr. N. V. Youngman has asked a question (September 15, 1945) and failed to supply the answer. The occasion, admittedly, was less suspicious; but Dr. Youngman has out-jested the jester by asking several questions—including the nature of epilepsy.

Now, Pilate was a wise man whose brevity became him and who successfully curbed any inclination to speculate. To him, no doubt, truth was as much a riddle as epilepsy has been to medical men for more than twenty centuries. It is still a riddle—despite the electroencephalogram. To say that epilepsy is a symptom and not a disease is to state a fact without achieving a definition. To maintain that epilepsy may be "symptomatic" or "essential" is to introduce a dichotomy without discernment. To reiterate the observation that seizures may be controlled is to embalm the obvious in terms of the didactic.

It seems to me that Dr. Youngman clouds rather than clarifies the issues raised by his questions. Nowhere in the whole wordy expanse of his paper does he state that epilepsy is a manifestation of a cerebral dysrhythmia—a condition found to exist in over 5% of the population. It may be that "worry, colds or menstruation" provoke epileptic attacks in those who have a constitutional predisposition; but this latter is surely none other than this cerebral dysrhythmia which may be demonstrated by the electroencephalogram. Cerebral dysrhythmia is the underlying factor in the majority of epileptics. Some people with a constitutional (and, possibly, inherited) cerebral dysrhythmia may show no symptoms; others will become the subjects of seizures psychogenetically precipitated, while others again may only manifest clinical epilepsy as the result of some gross cerebral lesion. Epilepsy can, of course, be induced by cerebral lesions and severe toxic states in patients who have no constitutional cerebral dysrhythmia.

Whereas Galen pinned his faith to powdered skull for the treatment of epilepsy, Dr. Youngman hails "Dilantin"—the last of more than half a hundred medicines used in epilepsy in the past century. "Dilantin" has been in fairly general use over the past seven years, taking precedence over phenobarbital of the last decade and bromide which belongs to the pharmacy of our ancestors. It is anticonvulsant and will curtail major seizures in the majority of persons suffering from epilepsy. It may be advantageously combined with phenobarbital. Its recommendation by Dr. Youngman is laudable enough, and it is not my intention to decry its virtues; but its exhibition in epilepsy does not answer Dr. Youngman's titular query. Nor can any medical agent, unless in addition to checking the seizures it controls or redeems the dysrhythmia.

Dr. Youngman adroitly side-steps the answer to his own question—and, presumably, the burning question in the minds of legions of epileptics the world over—by saying that 50% of them may have their seizures controlled. And, so saying, like the artful Pilate whose precedent he has unwittingly followed, he washes his hands of the whole matter.

The question he asks has echoed down the crowded corridors of time since the days of Hippocrates, and the affirmative answer is still slumbering inarticulate in the womb of hope.

Yours, etc.,

REG. S. ELLERY.

33, Collins Street,
Melbourne, C.1,
October 9, 1945.

SIR: In the September 15 issue of your journal Dr. Youngman asks a very pertinent question: "Can Epilepsy be Cured?" Of course, to answer that question one must know the cause of the complaint. We must all accept the fact that each variety of cell has its specific function and that that function may be influenced in two ways: it may be irritated to over-function or it may, on account of toxic poisons, be destroyed or reduce its function. It is obvious that in epilepsy we have a condition of certain cerebral cells over-acting, their function not being under proper control. It is also obvious that a variety of factors, such as pressure, inflammatory invasion, direct injury and certain toxins, may bring about this over-action, as is seen in birth and other injuries to the skull, uræmia, "Cardiazol" shock *et cetera*. In Jacksonian epilepsy the usual finding is the laying down of fibrous tissue on the surface of the brain; in many cases of epilepsy has been found the same deposit of fibrous tissue. Where fibrous tissue is not the result of injury, it is the result of inflammatory reaction to the presence of organisms. In the presence of some focus of infection there is either some intermittent or continuous bacterial entry to the blood stream. This may continue for a long period with little apparent material damage, but sooner or later some particular tissue becomes sensitized and there inflammatory reaction takes place. If we consider a simple case of iritis, nephritis or any other "itis" due to bacterial invasion of the blood stream, as it can come about by no other method, we must realize that there is the same concentration of organisms in the blood passing through every other tissue of the body as there is through the iris or kidney. We must also bear in mind that every body tissue is liable to become sensitized in the presence of bacterial invasion, so it would be foolish to exclude cerebral tissues. It has been shown, if indigo-carmine is introduced into the nose, that in a very few hours it can be demonstrated in the meninges and cerebral tissues, so we have quite a free passage from the nasal cavities. Now there are

two ways by which cerebral tissues and the meninges may be infected from the nasal sinuses: one is by organisms gaining entrance to the blood stream and the other is by direct invasion through the bony wall of the sinus. I have frequently pointed out the extraordinary prevalence of sinus infection and how it time and time again is overlooked. My hospital statistics showed that 25% of people attending out-patients were suffering from this complaint. Recently I have had several cases of severe epilepsy which have come on in adults following acute sinusitis, and would earnestly urge the thorough investigation of sinuses in all epileptics as well as other infections, as they may be blood borne as well as due to direct extension.

As to result of cure, this depends upon how much laying down of fibrous tissue has taken place, for once this has developed there is no more hope of a cure than there is in Jacksonian epilepsy. If cases are attended early where the inflammatory reaction is bringing about the fits, then there is some hope, as I have seen such cases permanently cured. One can readily understand cortical cerebral tissues irritated by bacterial toxins and inflammatory reaction, ready, under any excuse, to send out explosive stimuli, only needing some slight upset to let the trigger loose, and also how a certain amount of sedative may hold it in control. Once attention is forcibly directed into the right channel, there should be no great difficulty in proving the truth of these contentions.

Let us then give up this idea of idiopathic epilepsy and look upon it as we would a case of arthritis or the invasion of any other tissue, as it would be perfectly illogical to exclude cerebral tissues from such a happening.

Yours, etc.,

7, Raglan Street, SYDNEY PERN.
Ballarat,
Victoria.
Undated.

## THE PREVENTION OF FRACTURES DURING SHOCK THERAPY.

SIR: I wish to thank Dr. R. E. MacLean for his reply in the journal dated September 15 to my suggestions for the prevention of fractures during shock therapy.

I quite agree that manual, as opposed to mechanical, restraint has much in its favour, provided the team is constant and is specially trained. A considerable degree of rather nice judgement is necessary in countering spasmodic muscles in an unconscious patient. Otherwise fractures and/or avulsion of muscle insertions might easily be produced by sudden traction on the part of the attendant. Where such a team can be provided the incidence of fractures will probably be very small, whereas if it is impossible to have such assistance serious consideration should be given to the mechanical method of restraint.

Whichever method is used by those who administer shock therapy, I feel that our letters will have not been in vain if the incidence of these unfortunate fractures diminishes.

Yours, etc.,

A. R. HAMILTON.

British Medical Association House,
135, Macquarie Street,
Sydney.
October 24, 1945.

## RH TYPING AND BLOOD TRANSFUSION.

SIR: In *The Journal of the American Medical Association*, Volume CXXVIII, 1945, page 946, is an important note by Philip Levine. He found that fœtal death in first pregnancies in Rh-negative mothers of Rh-positive infants was associated in ten cases out of eleven with a history of blood transfusion. He indicates the absolute necessity of Rh typing before giving blood by vein or injection to female patients at any age. Only by such precaution can unintentional production of Rh agglutinins with their accompanying danger to a fœtus and the mother be avoided.

Yours, etc.,

R. DOUGLAS WRIGHT.

The University of Melbourne,
October 16, 1945.

# Special Correspondence.

## CANADA LETTER.

(By OUR SPECIAL CORRESPONDENT.)

THE end of the war has at last given Canada a chance to take stock of her medical needs. The high rate of rejection of men on physical grounds by the services (nearly 50%) has awakened the public conscience in this regard. This has occurred against a background of reconversion to peace-time economy. It seems unlikely that the dominant role assumed in Canada's fiscal policy by the Federal Government at Ottawa during the war will be relinquished to the provinces again. Provincial governments, nine in number, have always guarded their rights most jealously, but it is becoming clear that progress in health, though a provincial field of jurisdiction under the constitution, can only be made with the financial backing of a strong central government. Family allowances have just been instituted on the theory that they guarantee rapid circulation of money by the people whose needs are day to day, rather than long term. It was shown in Parliament that approximately 20% of the population were shouldering the job of raising 80% of the nation's children. The so-called "baby bonus" will only be paid where children go to school. (It may seem strange to Australians that until recently there was no compulsory education in the Province of Quebec.)

More specifically on the question of a national health policy, the Federal Government has proposed that the provinces give up the income tax collection field in return for federal help in instituting a system of national health insurance. Each province will be responsible for outlining and drafting its own system, which must come up to a minimum standard set by Ottawa. Within eighteen months of the ratification of this draft, the province must offer the following first-stage benefits: general practitioner service, hospitalization and a visiting nursing service. When Stage I is proclaimed, a date will be set for the commencement of Stage II, which will include: consultant, specialist and surgical care, private nurses, dental care, drugs, sera, surgical appliances and laboratory services.

The Federal Government has promised low interest loans to cities and rural areas wishing to build suitable hospital accommodation for their part of the plan. In addition federal aid will be given to the provinces for work in the fields of tuberculosis and venereal disease control, mental disease, and public health training and research.

Interesting developments in the field of medical education are taking place in the prairie province of Saskatchewan, where the first Labour government in Canada has been elected. The medical school in Saskatoon, which up till now has given only the two pre-clinical years of medicine, will soon become a degree-granting medical faculty upon the completion of arrangements for full clinical teaching. The Government hopes to make much more real than heretofore an equality of opportunity in both receiving a medical education and receiving medical care. The use of the air fields built under the Commonwealth Air Training Plan, as air ambulance bases, is being considered. Rural health units are to be developed around suitable hospitals, and the cooperative practice of medicine is being encouraged.

In the Pacific Coast province of British Columbia, the rapidly expanding University of British Columbia is preparing to open a full-blown medical school in 1947. Vancouver has a concentration of beds which makes it an admirable centre for clinical teaching, and it is to be hoped that student exchanges across the Pacific may soon become established. The good impresson made by Australian and New Zealand airmen who trained in Canada during the war has led Canadians to hope that many of their medical counterparts will visit Canada for study in the future.

The results of an interesting tuberculosis survey have just been published concerning 30,260 civil servants at Ottawa. Chest radiographs, sedimentation rates, sputum and the results of tuberculin tests were studied in each case. In all, 126 active cases of tuberculosis were found, 32 of them old cases. The overcrowding in Ottawa as a wartime capital is only partially to blame for this rate. It is obvious that a better control scheme than that at present in use is badly needed.

A recent survey of 600 graduating high school girls in all parts of Canada shows that 34% desire to enter the nursing profession, either through a training school or a university. Twelve *per centum* gave it as their second choice, while 22% said that they had given up the idea because of low wages, long hours and health hazards involved.

# National Emergency Measures.

## THE MEDICAL EQUIPMENT CONTROL COMMITTEE.

THE following correspondence is published at the request of the General Secretary of the Federal Council of the British Medical Association in Australia.

[COPY.]

COMMONWEALTH OF AUSTRALIA.

Department of Health,
Medical Equipment Control Committee,
31 Albert Road,
Melbourne, S.C.2,
26th October, 1945.

Dear Sir Henry,

I shall relinquish my position as Chairman of the Medical Equipment Control Committee on the 31st of this month and cannot do so without writing to you, as President of the Federal Council of the British Medical Association, to express my very great admiration and equally sincere gratitude for the manner in which all members of the Association have co-operated with me, and my Committee, in the task of maintaining adequate supplies of medical equipment to meet the needs of the three services and the civil population.

I recall that, in the earlier years of the work, there was an immediate and satisfactory response to an appeal for economy in the use of medical equipment, and that, in the succeeding years, every request made to medical practitioners in regard to the use of drugs and other items of equipment was met with speed, cheerfulness and efficiency. For example, there were no complaints when quinine was no longer available for obstetrical purposes; the necessity for drastic rationing of X-ray films was accepted with little, if any, complaint, and, indeed, I could give many other instances to illustrate the extent of the co-operation to which I have referred. There is, however, no necessity to enter into details. The fact remains that, in my opinion, the reputation of the medical profession as a whole must be greatly enhanced by the manner in which it has carried on during the war with the medical equipment made available to it.

The action of the profession in this field is comparable with that in the field of medical co-ordination, in which it accepted, without demur, conscription for service and other regulations much more severe than those enforced upon any other section of the community.

I shall be most grateful if, at some convenient date, you will give this message of gratitude from me and my Committee to all medical practitioners.

Believe me,

Yours very sincerely,

(Signed) ALAN NEWTON,
Chairman, Medical Equipment Control Committee.

Sir Henry Newland, C.B.E., D.S.O., F.R.C.S.,
President of the Federal Council of the B.M.A.,
Adelaide,
South Australia.

[COPY.]

163 North Terrace,
Adelaide,
5th November, 1945.

Dear Sir Alan,

I have received your letter dated October 26 in which you informed me that you would relinquish your position as Chairman of the Medical Equipment Control Committee on October 31.

I cannot allow the occasion to pass without, on behalf of the members of the British Medical Association, paying tribute to the tact and efficiency with which you and your Committee have always sought their co-operation. The Association takes especial pride in the distinguished service which you, as Chairman of the Medical Equipment Control Committee, have given to the Commonwealth and Empire.

I note with great appreciation your expression of admiration and gratitude for the manner in which all members of the British Medical Association have co-operated with you and your Committee in the difficult task of maintaining adequate supplies of medical equipment to meet the needs of the three services and the civil population.

The members of the Association will, I am sure, receive with sincere gratification your commendation of their efforts to co-operate with you and your Committee in the use of the medical equipment made available to them. That you should have extended your praise to the profession for its acceptance, without demur, of conscription for service, will be a source of pride and pleasure. I have taken action to ensure that the message from you and your Committee shall reach every member of the medical profession in the Commonwealth.

I am,

Yours very sincerely,

(Signed) H. S. NEWLAND,
President, Federal Council, British Medical Association of Australia.

Sir Alan Newton,
Chairman, Medical Equipment Control Committee,
Melbourne.

# Naval, Military and Air Force.

## APPOINTMENTS.

THE undermentioned appointments, changes *et cetera* have been promulgated in the *Commonwealth of Australia Gazette*, Numbers 171, 176, 187, 191, 207, 211 and 216, of September 6, 13 and 27, October 4 and 25, and November 1 and 8, 1945.

### NAVAL FORCES OF THE COMMONWEALTH.

#### Permanent Naval Forces of the Commonwealth (Sea-Going Forces).

*Extension of Appointment.*—The appointment of Surgeon Lieutenant-Commander Godfrey Joseph Kelleher Lane is extended for one year from 10th March, 1946, under the provisions of Section 17 of the Naval Defence Act.

*Termination of Appointments.*—The appointments of Surgeon Lieutenant-Commander Lowen Alexander Hardy and Acting Surgeon Commander Brian Andrew Serjeant, Emergency List, for temporary service, are terminated, dated 10th September, 1945, 13th August, 1945, and 28th August, 1945, respectively.

*Fixing Rates of Pay.*—Surgeon Lieutenant-Commanders Godfrey Joseph Kelleher Lane and Clive Laurence Statham are paid the rates of pay and allowances prescribed in the Naval Financial Regulations for Surgeon Commander (on promotion) whilst acting in that rank, dated 9th October, 1945.

*Emergency List.*

*Promotion.*—Surgeon Lieutenant Athol Herbert Robertson is promoted to the rank of Surgeon Lieutenant-Commander, dated 27th September, 1945.

#### Citizen Naval Forces of the Commonwealth.

*Royal Australian Naval Reserve.*

*Promotion.* — Acting Surgeon Lieutenant-Commander Nicholas Larkins is promoted to the rank of Surgeon Lieutenant-Commander, dated 9th September, 1945.

*Promotions.*—Surgeon Lieutenants Hamilton D'Arcy Sutherland, John Francis Rutter and Graeme Lindsay Grove are promoted to the rank of Acting Surgeon Lieutenant-Commander, dated 30th September, 1945.

*Fixing Rates of Pay.*—Surgeon Lieutenant Jack Dennis Isles is paid the rates of pay and allowances prescribed in the Naval Financial Regulations for Surgeon Lieutenant-Commander (on promotion), whilst acting in that rank, dated 9th October, 1945.

*Royal Australian Naval Volunteer Reserve.*

*Termination of Appointment.*—The appointment of Clifford Gerhardt Semler as Surgeon Lieutenant is terminated, dated 7th September, 1945.

### ROYAL AUSTRALIAN AIR FORCE.

*Permanent Air Force: Medical Branch.*

Temporary Group Captain E. A. Daley, M.B., B.S., D.T.M. (L), F.R.A.C.P., K.H.P. (1160), is granted the acting rank of Air Commodore whilst occupying an Air Commodore post with effect from 13th August, 1945.—(Ex. Min. No. 238—Approved 26th September, 1945.)

*Citizen Air Force: Medical Branch.*

Doctor Gordon Murray Tallent (257739) is appointed to a commission on probation with the rank of Squadron Leader for part-time duty with effect from 24th May, 1945.

The notification in respect of the transfer from the Reserve to the Active Force of Flight Lieutenant F. J. Gray (267808) appearing in the *Commonwealth of Australia Gazette*, No. 149, dated 2nd August, 1945, is cancelled.

The notification in respect of the termination of the grant of the acting rank of Squadron Leader to Temporary Flight Lieutenant H. G. Andrew (238733), appearing in the *Commonwealth of Australia Gazette*, No. 149, dated 2nd August, 1945, is amended to read with effect from 28th May, 1945.—(Ex. Min. No. 230—Approved 5th September, 1945.)

The appointment of Temporary Flight Lieutenant D. D. Cunynghame (267084) is terminated on medical grounds with effect from 1st August, 1945.

The following Flight Lieutenants are transferred from the Reserve to the Active Force for full-time duty with effect from 22nd July, 1945: J. V. Vaughan (257698), P. M. Birrell (297470), G. C. Morrison (257664), I. H. Ogilvy (257507), D. L. Rodgers-Wilson (257702), P. H. Cohen (257700), G. A. Leyland (287460), M. Cohen (297484), A. C. Newell (257690), L. L. Lewis (267760), H. P. Greenberg (267761), T. Early (297427), J. E. Joseph (257661).

Flight Lieutenant J. L. Pollock (3216) is transferred from the Reserve to the Active Force for part-time duty with effect from 21st June, 1945. He is promoted to the temporary rank of Squadron Leader with effect from the same date.

The notification in respect of the recall to the Active Force of Temporary Squadron Leader V. R. Meek (261662) appearing in the *Commonwealth of Australia Gazette*, No. 119, dated 14th June, 1945, is amended to read with effect from 26th March, 1945.

The appointment of Temporary Flight Lieutenant W. F. A. Harris (297466) is terminated on medical grounds with effect from 6th August, 1945.

The probationary appointment of Flight Lieutenant L. D. Walters (277535) is confirmed with effect from 26th August, 1945.—(Ex. Min. No. 241—Approved 26th September, 1945.)

The appointment of Temporary Squadron Leader V. S. Howarth (261522) is terminated on having completed long service with effect from 29th August, 1945.

The appointment of Temporary Squadron Leader H. A. A. Altmann (251766) is terminated on medical grounds with effect from 23rd August, 1945.

The following Flight Lieutenants are granted the acting rank of Squadron Leader whilst occupying Squadron Leader posts with effect from the dates indicated: C. L. Gibbons (263898), 1st December, 1944, R. E. Woods (296330), 14th September, 1945.

The following Flight Lieutenants are transferred from the Reserve to the Active Force with effect from 26th August, 1945: K. H. Pike (277438), A. S. Feddersen (257692), W. G. MacGregor (257506), P. J. White (257696), F. J. Gray (267808), R. K. Smyth (257715), W. M. Calanchini (257721), P. Grattan-Smith (267785), R. W. M. Gray (267762), J. L. Fordyce (257695), T. J. Thwaite (267766).

The notification in respect of the transfer to the Active Force of Flight Lieutenant C. I. Wilkinson (277479), appearing in the *Commonwealth of Australia Gazette*, No. 149, dated 2nd August, 1945, is amended to read with effect from 26th August, 1945.

*Reserve: Medical Branch.*

Temporary Flight Lieutenant L. J. Ray (253941) is transferred from the Active List with effect from 17th July, 1945—(Ex. Min. No. 232—Approved 5th September, 1945.)

Temporary Squadron Leader D. B. Skewes (251281) is transferred from the Active List with effect from 2nd August, 1945.—(Ex. Min. No. 233—Approved 12th September, 1945.)

The following medical practitioners are appointed to commissions on probation with the rank of Flight Lieutenant with effect from the dates indicated: Maurice Gustav Wennington Ingram (257742), 8th March, 1945, Dermot Clark Ryan (277548), 6th June, 1945.—(Ex. Min. No. 235—Approved 12th September, 1945.)

The following Temporary Squadron Leaders are transferred from the Active List with effect from 1st August, 1945: T. H. Donnelly (291605), R. J. Riddell (251660).

The appointments of the following Temporary Flight Lieutenants are terminated with effect from 14th August, 1945: R. V. Selwood (297433), F. J. Gray (267808).—(Ex. Min. No. 251—Approved 24th October, 1945.)

The following officers are transferred from the Active List with effect from the dates indicated: (Temporary Wing Commanders) S. W. Lush (1193), 22nd August, 1945, B. J. Basil-Jones (261289), 30th August, 1945, (Squadron Leaders) D. P. Sapsford (271742), 18th August, 1945, W. C. Holley (261519), 23rd August, 1945, J. W. L. Price (262118), 29th August, 1945.

The following medical practitioners are appointed to commissions on probation with the rank of Flight Lieutenant with effect from the dates indicated: Robert James Callander (257743), 17th July, 1945, William James Grey (297494), 18th July, 1945.—(Ex. Min. No. 259—Approved 31st October, 1945.)

## Post-Graduate Work.

### A HANDBOOK ON REHABILITATION.

PRINTED copies of a handbook, "Facts about Rehabilitation for Medical Officers of the Services", compiled by the New South Wales Post-Graduate Committee in Medicine in conjunction with the New South Wales Branch of the British Medical Association, will shortly be available on application to the Post-Graduate Committee, 131, Macquarie Street, or to the New South Wales Branch of the British Medical Association, 135, Macquarie Street, Sydney.

### LECTURES FOR MEDICAL GRADUATES AT SYDNEY.

THE following lectures for medical graduates have been arranged:

January 7, 1946: Courses of ten weeks' duration for Part I of the examinations for the following degree and diplomas: M.S., D.Ophth., D.L.O., D.G.O.

January 7, 1946: Course of ten weeks' duration for general practitioners.

January 7, 1946: Advanced course in medicine of ten weeks' duration.

February 4, 1946: Advanced course in surgery of six weeks' duration.

Full information may be obtained from the Secretary of the Post-Graduate Committee, 131, Macquarie Street, Sydney, telephones BW 7483, B 4606.

## Australian Medical Board Proceedings.

### QUEENSLAND.

THE undermentioned have been registered, pursuant to the provisions of *The Medical Acts, 1939 to 1940*, of Queensland, as duly qualified medical practitioners:

Corlis, Geoffrey Charles, M.B., B.S., 1939 (Univ. Sydney), R.A.A.F.

Doig, Ronald Keith, M.B., B.S., 1944 (Univ. Melbourne), on active service.

## Obituary.

### ARCHIBALD JOHN ASPINALL.

WE regret to announce the death of Dr. Archibald John Aspinall, which occurred on December 5, 1945, at Turramurra, New South Wales.

## Books Received.

"A Method of Anatomy: Descriptive and Deductive", by J. C. Boileau Grant, M.C., M.B., Ch.B., F.R.C.S. (Edin.); Third Edition; 1944. Baltimore: The Williams and Wilkins Company. 10" × 7", pp. 846, with many illustrations. Price: 48s.

"An Index of Differential Diagnosis of Main Symptoms", by various writers, edited by Herbert French, C.V.O., C.B.E., M.A., M.D. (Oxon.), F.R.C.P., assisted by Arthur H. Douthwaite, M.D., F.R.C.P.; Sixth Edition; 1945. Bristol: John Wright and Sons Limited. 10" × 6½", pp. 1136, with 798 illustrations, 98 in colour. Price: 84s.

"Psychiatric Aspects of Modern Warfare", by Reg. S. Ellery, M.D., F.R.A.C.P.; 1945. Melbourne: Reed and Harris. 8¼" × 5½", pp. 191, with 8 illustrations. Price: 12s. 6d.

"Physical Treatment by Movement, Manipulation and Massage", by James B. Mennell, M.A., M.D., B.C.; Fifth Edition; 1945. London: J. and A. Churchill Limited. 8¾" × 5½", pp. 533, with many illustrations, some in colour. Price: 30s.

"Tetryl Dermatitis", by H. M. L. Murray, L.R.C.P., L.R.C.S., L.R.F.P.S., D.P.H., R. W. Prunster, B.Sc. (Agric.), and R. D. Anderson, B.Agr.Sc.; 1944. Technical Report No. 2, Industrial Welfare Division, Department of Labour and National Service, Commonwealth of Australia. 9½" × 6", pp. 64.

"Controlled Projection: A Standard Experimental Procedure", arranged by John C. Raven, M.Sc.; 1944. London: H. K. Lewis and Company. 10¼" × 8¼", pp. 76, with many illustrations and three projection sketches. Price: 12s. 6d.

"A Bibliography of Visual Literature, 1939-1944", compiled by John F. Fulton, Phebe M. Hoff and Henrietta T. Perkins; 1945. Washington: Committee on Aviation Medicine, Division of Medical Sciences National Research Council. Springfield: Charles C. Thomas. 10¼" × 7¼", pp. 127. Price: $3.00.

"The Cousin from Fiji", by Norman Lindsay; 1945. London, Sydney: Angus and Robertson, Limited. 8½" × 5½", pp. 265. Price: 8s. 6d.

"Textbook of Neuropathology", by Arthur Weil, M.D., Associate Professor of Neuropathology, Northwestern University Medical School; Second Edition; 1945. New York: Grune and Stratton. 9" × 6", pp. 372, with 289 illustrations. Price: $5.50.

"Men Under Stress", by Roy R. Grinker, Lieutenant-Colonel, M.C., and John P. Spiegel, Major, M.C., Army Air Forces; 1945. Philadelphia: The Blakiston Company. 9" × 6", pp. 496. Price: $5.00.

"Radium Therapy: Its Physical Aspects", by C. W. Wilson, M.Sc., Ph.D., F.Inst.P.; 1945. London: Chapman and Hall Limited. 8¼" × 5¼", pp. 235, with many illustrations. Price: 18s.

"Outlines of Physical Methods in Medicine", by G. D. Kersley, M.A., M.D., F.R.C.P.; 1945. London: William Heinemann (Medical Books) Limited. 7¼" × 5", pp. 95. Price: 6s. net.

"The Rheumatic Diseases", by G. D. Kersley, M.A., M.D., F.R.C.P.; Second Edition; 1945. London: William Heinemann (Medical Books) Limited. 8¼" × 5½", pp. 132, with many illustrations. Price: 15s. net.

"The Tissues of the Body: An Introduction to the Study of Anatomy", by W. E. Le Gros Clark, F.R.S.; Second Edition; 1945. Oxford: Humphrey Milford, Oxford University Press. 9¼" × 6", pp. 400. Price: 21s. net.

"Extensile Exposure Applied to Limb Surgery", by Arnold K. Henry, M.B. (Dublin), M.Ch. (Hon., Cairo), F.R.C.S.I.; 1945. Edinburgh: E. and S. Livingstone Limited. 9¾" × 6¾", pp. 188, with many illustrations. Price: 30s. net.

"Active Psychotherapy", by Alexander Herzberg, M.D., Ph.D. (Berlin), 1945. London: Research Books Limited. 8½" × 5½", pp. 152. Price: 12s. 6d. net.

"Recent Advances in Obstetrics and Gynæcology", by Aleck W. Bourne, M.A., M.B., B.Ch. (Camb.), F.R.C.S. (England), F.R.C.O.G., and Leslie H. Williams, M.D., M.S. (London), F.R.C.S. (England), F.R.C.O.G.; Sixth Edition; 1945. London: J. and A. Churchill Limited. 8" × 5¼", pp. 367, with 77 illustrations. Price: 18s.

## Medical Appointments.

Dr. E. H. Derrick, Director, Laboratory of Microbiology and Pathology, Department of Health and Home Affairs, Queensland, has been appointed Acting Deputy Director of the Queensland Institute of Medical Research.

Dr. T. Shepherd has been appointed an examiner for the Nurses' Registration Board under the provisions of the *Nurses' Registration Act*, 1921-1944, of Western Australia, for a period of twelve months.

Dr. W. C. T. Chambers has been appointed Registrar of the Royal Adelaide Hospital, Adelaide.

Dr. M. H. Draper has been appointed Temporary Resident Medical Officer, Parkside Mental Hospital, South Australia.

Dr. C. E. Winston has been appointed a member of the Nurses' Registration Board, in pursuance of the provisions of the *Nurses' Registration Act*, 1924-1932, of New South Wales.

Dr. P. O. Flecker has been appointed Temporary Resident Medical Officer, Parkside Mental Hospital, South Australia.

Dr. N. G. Reid has been appointed Government Medical Officer at Nanango, Queensland.

Dr. E. W. Kyle has been appointed Medical Officer of Health, Bassendean Road Board, Western Australia.

Dr. C. A. Finlayson has been appointed an official visitor to the Parkside Mental Hospital, South Australia.

Dr. J. S. Stewart has been appointed Acting Medical Superintendent of the Royal Adelaide Hospital, Adelaide, South Australia.

Dr. J. J. Holland, Dr. B. W. Buttsworth and Dr. Alan Gray have been appointed examiners under the *Nurses' Registration Act*, 1921-1944, of Western Australia, for a period of twelve months as from October 1, 1945.

Dr. R. G. Plummer has been reappointed Registrar of the Royal Adelaide Hospital, Adelaide, South Australia.

Dr. W. B. Ryan has been appointed Medical Superintendent, Mental Hospital, Mont Park, Janefield, and Repatriation Hospital, Bundoora, Victoria.

## Diary for the Month.

DEC. 17.—Victorian Branch, B.M.A.: Hospital Subcommittee.
DEC. 17.—Victorian Branch, B.M.A.: Finance, House and Library Subcommittee.
DEC. 18.—Victorian Branch, B.M.A.: Organization Subcommittee.
DEC. 18.—New South Wales Branch, B.M.A.: Ethics Committee.
DEC. 20.—South Australian Branch, B.M.A.: Council Meeting.
DEC. 20.—Victorian Branch, B.M.A.: Executive Meeting.
DEC. 21.—Queensland Branch, B.M.A.: Council Meeting.
DEC. 26.—Victorian Branch, B.M.A.: Council Meeting.

## Medical Appointments: Important Notice.

MEDICAL PRACTITIONERS are requested not to apply for any appointment mentioned below without having first communicated with the Honorary Secretary of the Branch concerned, or with the Medical Secretary of the British Medical Association, Tavistock Square, London, W.C.1.

*New South Wales Branch* (Honorary Secretary, 135, Macquarie Street, Sydney): Australian Natives' Association; Ashfield and District United Friendly Societies' Dispensary; Balmain United Friendly Societies' Dispensary; Leichhardt and Petersham United Friendly Societies' Dispensary; Manchester Unity Medical and Dispensing Institute, Oxford Street, Sydney; North Sydney Friendly Societies' Dispensary Limited; People's Prudential Assurance Company Limited; Phœnix Mutual Provident Society.

*Victorian Branch* (Honorary Secretary, Medical Society Hall, East Melbourne): Associated Medical Services Limited; all Institutes or Medical Dispensaries; Australian Prudential Association, Proprietary, Limited; Federated Mutual Medical Benefit Society; Mutual National Provident Club; National Provident Association; Hospital or other appointments outside Victoria.

Queensland Branch (Honorary Secretary, B.M.A. House, 225, Wickham Terrace, Brisbane, B.17): Brisbane Associated Friendly Societies' Medical Institute; Bundaberg Medical Institute. Members accepting LODGE appointments and those desiring to accept appointments to any COUNTRY HOSPITAL or position outside Australia are advised, in their own interests, to submit a copy of their Agreement to the Council before signing.

*South Australian Branch* (Honorary Secretary, 178, North Terrace, Adelaide): All Lodge appointments in South Australia; all Contract Practice appointments in South Australia.

*Western Australian Branch* (Honorary Secretary, 205, Saint George's Terrace, Perth): Wiluna Hospital; all Contract Practice appointments in Western Australia. All Public Health Department appointments.

## Editorial Notices.

MANUSCRIPTS forwarded to the office of this journal cannot under any circumstances be returned. Original articles forwarded for publication are understood to be offered to THE MEDICAL JOURNAL OF AUSTRALIA alone, unless the contrary be stated.

All communications should be addressed to the Editor, THE MEDICAL JOURNAL OF AUSTRALIA, The Printing House, Seamer Street, Glebe, New South Wales. (Telephones: MW 2651-2).

Members and subscribers are requested to notify the Manager, THE MEDICAL JOURNAL OF AUSTRALIA, Seamer Street, Glebe, New South Wales, without delay, of any irregularity in the delivery of this journal. The management cannot accept any responsibility or recognize any claim arising out of non-receipt of journals unless such a notification is received within one month.

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